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CALIFORNIA SOLID WASTE MANAGEMENT STUDY (1968) AND PLAN (1970)

California State Department of Public Health

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Public Health Service
Environmental Protection Agency

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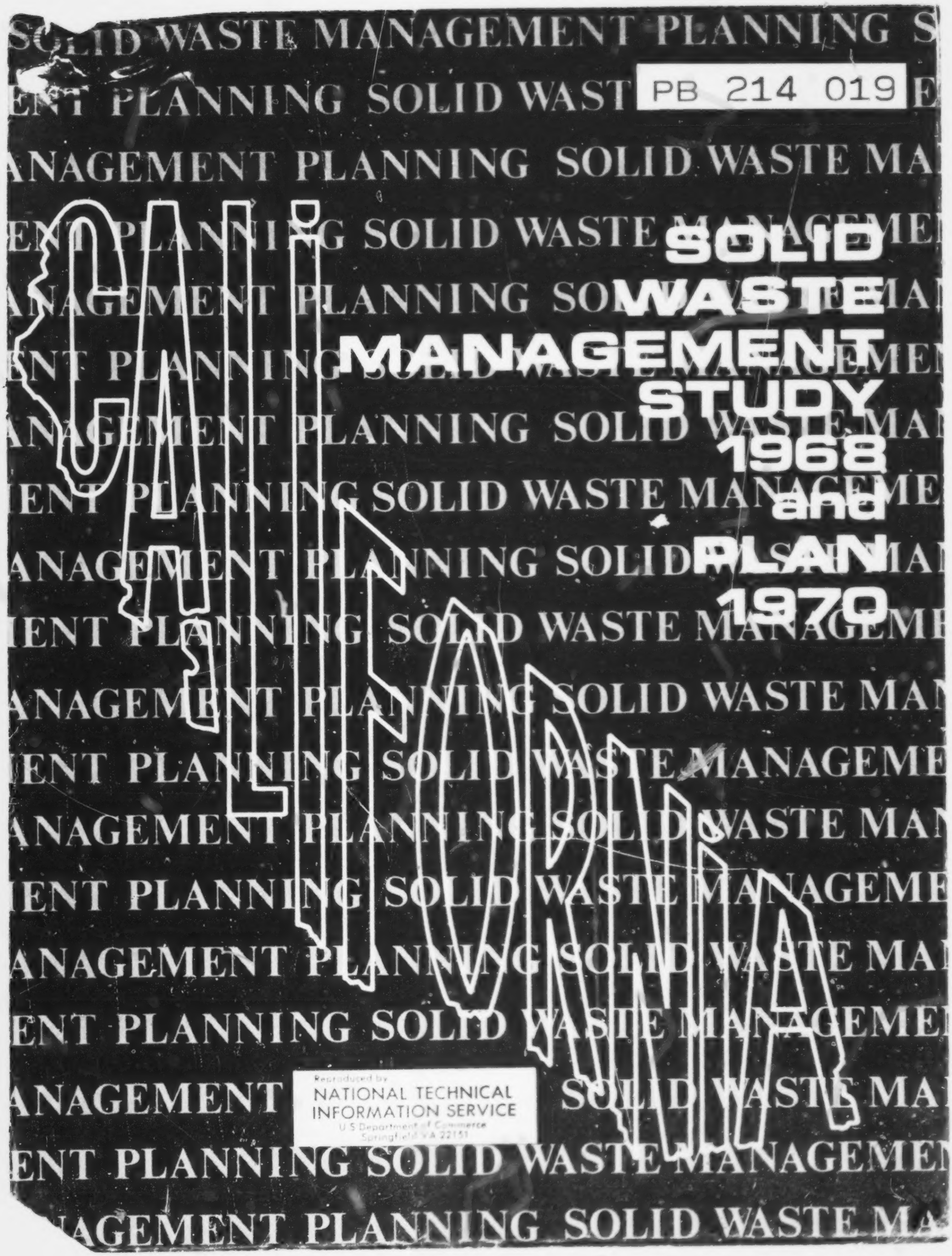
SOLID WASTE MANAGEMENT PLANNING

CALIFORNIA

SOLID WASTE MANAGEMENT STUDY 1968 and PLAN 1970

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SOLID WASTE MANAGEMENT STUDY (1968) AND PLAN (1970)

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FOREWORD

TO ENCOURAGE SYSTEMATIC PLANNING for better management of the Nation's solid wastes, Congress in the 1965 Solid Waste Disposal Act provided grant monies for the States for solid waste planning.[1] By June 1966, fourteen States had met the stipulations of the Act and had embarked upon the planning process with the help of the Federal funds. Today, almost every State has applied for and received a solid waste planning grant.[2] From each of the grants the Federal government expects two practical results: first, a plan (and report) for the State's management of its solid wastes; second, development of an agency for the managing function.[3]

The present document publishes the data base for the California solid waste management plan, developed by the State under a Federal solid waste management planning grant that went into effect June 1, 1966. The data reported on in the first part of the book provide the base for the California plan objectives reported on in the second part of this volume. But, the planning process is dynamic; future revision will be an important part of the process to take account of changing conditions and better data. Moreover, a plan is not an end in itself. Its formulation is the key to action: to legislation, standards, technical assistance, public relations, and enforcement.

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[1] The Solid Waste Disposal Act; Title II of Public Law 89-272, 89th Congress, S.306, October 20, 1965. Washington, U.S. Government Printing Office, 1966. 5 p.

[2] Toftner, R. O., D. D. Swavely, W. T. Dehn, and B. L. Sweeney, comps. State solid waste planning grants, agencies, and progress--1970. Public Health Service Publication No. 2109. Washington, U.S. Government Printing Office. (In press.)

[3] Toftner, R. O. Developing a state solid waste management plan. Public Health Service Publication No. 2031. Washington, U.S. Government Printing Office, 1970. 50 p.

Besides providing the State solid waste management agency with a guide for action, the State plan will help to guide local and regional solid waste planning and subsequent implementation. The plan can also provide support for improved State legislation related to solid waste management.

California's plan is designed, therefore, to: (1) begin the planning process; (2) establish policies and procedures to guide the State solid waste agency, the Department of Public Health; (3) guide regional planning; (4) provide a documented base for improved solid waste legislation and operating regulations. With these objectives in mind, this plan report presents and analyzes pertinent solid waste data, identifies problems indicated by the data, sets objectives that if achieved would solve identified problems, and finally, proposes immediate, intermediate, and long-range measures for achieving objectives. This plan should thus provide the California solid waste agency with an invaluable management tool with which to begin solving the State's solid waste management problems.

--RICHARD D. VAUGHAN
Assistant Surgeon General
Acting Commissioner
Solid Waste Management Office

SYNOPSIS

California possesses incomparable natural beauty and an environment which is conducive to the enjoyment of living. The quality of this environment, however, is being threatened by ever-increasing quantities of solid wastes which are being disposed of into our air, our water, and onto our land. Solid wastes are creating health hazards and nuisances, and are causing water and air pollution; they are steadily degrading land values and are imposing a rising economic burden on California's population. The pollution of land has also become increasingly evident in the desecration of forests, fields, and hillsides by open dumps, litter, piles of automobiles, and mounds of manure and in the frequent indiscriminant dumping of infectious and toxic wastes.

The California Department of Public Health, assisted by a planning grant from the U.S. Public Health Service, has completed an intensive statewide study and analysis of current solid waste management practices. This interim report (Volume I) presents the study's findings and conclusions relating to the existing status of solid waste management. A second report, which will include recommendations for a comprehensive state program to establish effective solid waste management practices, will be presented to the Legislature in the latter part of 1969.

During 1967, California's municipalities, industry, and agriculture generated an estimated 70 million tons of solid wastes, an average of 20 pounds per person per day. In an uncompacted condition, this product of a single year may be visualized as a mass of solid wastes 100 feet wide and 30 feet high stretching from Oregon to Mexico. This staggering and steadily increasing volume challenges a technology which is struggling unsuccessfully to meet only the most fundamental existing needs.

Five basic areas of deficiency are evident in the present status of solid waste management in California: (1) fragmented authority and lack of cooperation and coordination; (2) inadequate planning; (3) nonexistent or inadequate standards; (4) primitive technology; and (5) inadequate financing.

At the present time, various governmental jurisdictions representing 58 counties, 399 incorporated cities, numerous special districts, and several state and federal agencies are attempting to manage solid waste operations in the absence of common purpose or defined objectives and with an inevitable lack of consistency with respect to policy, planning, and standards.

State laws regarding solid wastes are, for the most part, directed primarily towards minimizing water and air pollution, preventing forest fires, protecting fish and wildlife, assuring the health of livestock and preserving the aesthetics of highways. What is lacking, however, are solid waste laws designed specifically to protect the health and well-being of people.

Most of the municipal solid wastes produced in California are disposed of in 716 general use disposal sites of which 71% are open burning dumps. Less than 10% can be classified as sanitary landfills. No comprehensive plans for solid waste management have been developed for the future and present action is stimulated primarily by impending crises. Only 16 of the 58 counties have undertaken any solid waste study or planning activities and many of these plans ignore the needs of the incorporated cities and adjacent counties.

The quality of California's land, air, and water resources is vital to the future of the state. Yet, the present system of solid waste management, which directly affects all of our natural resources, is clearly inadequate to assure the preservation of the quality of these resources at levels that best serve the public interest.

California can no longer afford to delay in facing its basic responsibilities in solid waste management. The increasing volumes of solid wastes and related environmental effects threaten to soon reach unmanageable proportions. It is imperative that the state assume leadership and initiative in coping with these problems. In close collaboration with local jurisdictions and the private sector, the state should develop solid waste policies and programs which adequately protect human health and well-being, and which can be looked upon to conserve and improve the quality of our total environment.

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I. INTRODUCTION

A. RATIONALE AND PURPOSE OF STUDY

The National Academy of Sciences has defined pollution as "an undesirable change in the physical, chemical, or biological characteristics of our air, land, and water that may or will harmfully affect human life or that of other desirable species, our industrial processes, living conditions, and cultural assets; or that may or will waste or deteriorate our raw material resources"[1]

The solid wastes produced by municipalities, industries, and agriculture are some of the most significant pollutants in California. These wastes are being produced in staggering quantities and occur as an endless variety of materials. The deleterious effects that the disposal of these materials have on our environment are matters of growing concern. Solid wastes pollute land, water, or air, depending in degree and kind upon the method of disposal. Indiscriminate disposal of solid wastes is seriously degrading various elements of our environment, resulting in obvious adverse effects such as health hazards and nuisances. Many of the debilitating effects on human beings are difficult to assess either physiologically or psychologically.

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[1] National Academy of Sciences - National Research Council, Waste Management and Control, Publication 1400 (Washington, D.C., 1966), p.3

The quality of California's land, air, and water resources is of paramount importance and concern to the future of the state. Yet, the present system of solid waste management, which directly affects all of these elements, is clearly inadequate to assure the preservation of the quality of these resources at levels that best serve the total public interest.

The growing environmental problems identifiable with solid wastes in California may be summarized as:

(1) The creation of severe disease-carrying domestic fly and rodent densities as a result of poorly managed solid wastes;

(2) Air pollution and smoke nuisance problems from widespread burning of solid wastes;

(3) Pollution of ground and surface waters from inadequate solid waste disposal systems; and,

(4) The proliferation of public nuisances from odors, smoke, fire hazards, and unsightliness.

Other more indirect effects of current solid waste disposal practices include a rising economic burden, degraded property values from land pollution, and continued erosion of the natural beauty of California's communities and countryside.

Solid waste is inherently integrated into the total problem of air and water pollution. For example, the burning of solid wastes may increase air pollution, while the use of garbage grinders increases the load on the sewage disposal systems. On the other hand, measures undertaken to abate air pollution or to decrease the concentration of solids in liquid wastes usually result in an increase in the quantity of solid wastes that must be handled. Solid wastes are inevitable by-products of households and municipalities and, in fact, all of man's living activities and productive processes. Business, industry, and agriculture all generate solid wastes.

Since the turn of the century, California's population has increased from less than 1.5 million to nearly 20 million. Along with its new rank as first among the 50 states in population, agricultural production, and industrial growth, California is also a leader in the production of solid, liquid, and gaseous wastes. Considerable attention has been focused on the problems of controlling liquid and gaseous wastes and noteworthy progress has been made toward their solution. In the field of solid waste management, however, we are lagging far behind the times in the development of management techniques and a technology adequate to meet the problem.

The growing recognition of environmental degradation by solid wastes has brought a new awareness of the issues concerning solid waste management. The increased crowding together of urban, industrial, and agricultural areas is resulting in a rapidly diminishing land area for waste disposal. This situation, accompanied by a logarithmic increase in production of wastes and a lagging technology, is compounding the problems of disposal.

B. SCOPE AND OBJECTIVES

Rising concern for the solid waste crisis by the federal government led to legislative enactment of the "Solid Waste Disposal Act of 1965". This act provided funds for the purpose of developing and demonstrating new techniques and methods of managing solid wastes. Also included were funds for use by state agencies, in developing comprehensive plans for dealing with this problem. The availability of this support, coupled with a growing awareness of solid waste management needs by the state, led to a directive by the Governor in 1966 designating the Department of Public Health as the State's agency to receive these planning funds. The State Department of Public Health was thereupon assigned the responsibility for undertaking a three-year study to develop the basis for a statewide planning program for effective management of solid wastes in California. This study, known as the California Solid Waste Planning Study, was initiated in July 1966. The final report of the study will be available in 1969.

The primary objective of the California Solid Waste Planning Study is to develop the framework of a statewide plan for the management of solid wastes, recognizing the interests and responsibilities of local, regional, and state agencies, and private industry. Specific objectives of the study include the following:

1. To determine the quantities and sources of each major type of municipal, industrial, and agricultural solid wastes produced in the state.
2. To document and evaluate existing facilities and methods for handling solid wastes and to determine their potential for continued use.
3. To determine the extent of adverse or beneficial environmental modifications created by present solid waste handling and disposal practices.
4. To identify and evaluate current regulatory controls, policies, and management practices and respective functions of state, county, district, and city jurisdictions relating to solid wastes.
5. To determine the extent and nature of local planning for solid waste management and to evaluate local and regional solid waste master plans.
6. To project future problems facing California in terms of: (a) quantities of solid wastes produced by municipalities, industry and agriculture, (b) changes and trends affecting solid waste management practices, and (c) their impact and effect on environmental quality.
7. To develop a foundation for a comprehensive state program for the

effective management of solid wastes produced in California.

This interim report summarizes the findings of the study relative to objectives 1 - 5. Further evaluation of current problems and projected requirements, and the recommendations for future program development will be presented in the final report in 1969.

C. GENERAL PROCEDURE

It was determined that two generalized types of information were needed to evaluate the existing status of solid waste management in California. One was information on solid waste management per se. In other words, determining the specific role of governmental jurisdictions, industry, and agriculture in solid waste regulation and control; planning; policy determination; and storage, collection, and disposal practices. A questionnaire was developed by the Department for the purpose of obtaining much of this information. This form was utilized in interviews with representatives of all of the counties and incorporated cities, and many of the more directly concerned special districts.

Inasmuch as most of the solid wastes in California are disposed of on land, the second category of information needed was data on the disposal sites. Information regarding the description of the site, types and quantities of wastes received, size and capacity, operational practices, and evaluation of existing or potential problems was gathered by means of a disposal site survey. This survey included a field visit to every recognized disposal site in the state. Disposal sites were divided into two categories: "general use" and "supplemental". General use sites were those which received wastes from the general public and collectors and received a variety of wastes. Supplemental sites were those which received only a specific type of waste (e.g., street sweepings, slag, cannery wastes, etc.), or served only a special group such as a resort, campground, or construction site. Unlike general use sites, supplemental sites in many instances were not regulated by the local jurisdictions. Operational details were unavailable for many of these supplemental sites. Only the data regarding general use sites have been included in this report.

The procedure followed in collecting data on solid waste management throughout the state included a field inventory as indicated above, using the county as the basic unit of work activity. The initial contacts in the 58 counties were with the local health agencies, all of which had previously assured the Department of their willingness to participate in the study. Usually the local agency held an organizational meeting several weeks in advance of the survey to allow the state staff to explain the project to representatives of the various county and city agencies and others having an interest in the proposed study. At this meeting there was a general discussion of local conditions and a work schedule for the purpose of gathering information was outlined. The meeting provided the necessary contacts and background and established the proper working relationships with the local interests.

This study is being conducted within the Department of Public Health by the staff of the Solid Waste Engineering Section, Bureau of Vector Control and Solid Waste Management. The local health agencies throughout the state have participated and immeasurably assisted the state staff in the gathering of basic data. The participation and assistance of private industry, as well as other state and local agencies have contributed significantly to this interim report.

Since solid wastes include such a wide range of materials, it is important that standardized definitions and terminology be adopted to minimize confusion. Unfortunately, such confusion is already extensive in statutes, literature, and in the vocabularies of professionals and laymen alike, particularly when such terms as garbage, rubbish, refuse, trash and solid wastes are used interchangeably. Wastes may be classified by physical character such as organic or inorganic, putrescible or nonputrescible, combustible or noncombustible, or further by their point of origin such as household, commercial, institutional, industrial, and agricultural. Further description and confusion is added when one separates the various types of solid wastes such as dead animals, sewage solids, abandoned vehicles, demolition wastes, ashes, and street refuse. The following are definitions of some of the general terms used in this report:

Solid Wastes - All those materials that are solid or semi-solid and that the possessor no longer considers of sufficient value to retain. For the purposes of this report, the term solid wastes is all inclusive and considers all types of classifications, sources and properties.

Refuse - All of the solid wastes normally handled in any waste management system. This term is commonly used to denote a heterogenous mixture of solid waste materials from several sources.

Garbage - Animal, fruit, or vegetable residues resulting from the handling, preparation, and cooking of foods. When stored separately or used as animal feed (more free liquid usually exists), it sometimes is referred to as swill.

Rubbish - Combustible and noncombustible solid wastes of households, commercial establishments, institutions, etc., exclusive of the highly putrescible wastes (garbage). Rubbish consists of such materials as paper, metal, wood, cans, furniture, yard trimmings, and ceramics.

Further detail regarding categorization and composition of municipal, industrial, and agricultural solid wastes is found in Chapter III, SOLID WASTE PRODUCTION.

II. SUMMARY AND FINDINGS

Solid waste management may be defined as a planned system of effectively controlling the production, storage, collection, transportation, processing, and disposal or utilization of solid wastes in a sanitary, aesthetically acceptable, and economical manner. It includes all administrative, financial, legal, and planning functions as well as the physical aspects of solid waste handling.

It is the purpose of this interim report to present the findings of a comprehensive survey of the existing status of solid waste management in California. Included in this report are summary data on sources of origin and the quantities of wastes currently being produced, a summary of current laws and regulations concerned with solid wastes, the methods utilized for collection and disposal, an analysis of the effects of current solid waste management on public health and environmental quality, and the current status of planning for solid wastes.

A. DEFICIENCIES IN SOLID WASTE MANAGEMENT

An analysis of the data results in a readily formed conclusion that solid waste management, as currently practiced in California, is most unsatisfactory. During 1967 a total of 71.5 million tons of solid wastes was produced in the state. This staggering amount of material, confronting a technology inadequate to meet barest existing needs, presents a formidable threat to the future environment of California. These aspects, however, are not the only factors contributing to the solid waste problem as it now exists. Perhaps of gravest concern are the unrealistic approaches to solid waste management as practiced today. Solid waste management problems facing metropolitan, suburban, and rural regions have reached crisis or near-crisis points in many areas. The critical need for effective statewide and regional approaches to waste management has been emphasized by many outstanding private consultants as well as by some local and state agencies and officials.

Solid waste disposal in California has been and is based upon a fragmented jurisdictional approach. Each political entity bases its waste disposal method on inherited operational procedures or on methods that are the result of hasty decisions to provide a stopgap solution to a pressing disposal problem. Since, at its source, solid waste is of negative value, the modus operandi has been to provide at the least possible direct cost, a method of disposal that would satisfy only the immediate minimum requirements for health and safety.

Solid waste management generally has become a function of a haphazard combination of public and private sectors. While this combination need not be an inherent deterrent to effective waste management operations, it has in most instances, as currently practiced, reduced their effectiveness. This condition, along with the existence of a large number of fragmented local jurisdictions, has compounded the problems of waste management. If each local government attempts to manage the solid wastes within its political jurisdiction, the criteria for making its decisions are necessarily based on a relatively small number of technically feasible alternative solutions. This also imposes economic limitations and enhances the environmental abuses that usually result from small-scale operations.

At the present time, California has 58 counties, 399 cities, numerous special districts, and several state and federal agencies attempting to manage solid waste operations. The inability of jurisdictions to absorb their own wastes is evidenced by the fact that 363 of the 399 cities dispose of some or all of their wastes outside of their city boundaries. In addition, 25 counties export some refuse for disposal to other counties.

While subsequent sections of this report provide an analysis in further detail, the areas of deficiency can be summarized under these five major categories:

(1) Fragmented Authority and Lack of Cooperation. Numerous governmental jurisdictions and private interests are concerned with the regulation, collection, utilization, and disposal of solid wastes in California. Cities, counties, special districts and numerous state and federal agencies in California are empowered to establish policy and standards, conduct planning programs, and operate collection and disposal systems in the field of solid wastes. The most notable deficiency observed is the general lack of consistency with respect to policy, planning, and standards. In addition, with but few exceptions, cooperative effort between jurisdictions is largely nonexistent.

(2) Inadequate Planning. Adequate plans to cope with the increasing volumes of solid wastes and diminishing land for disposal purposes have not been developed. Only 16 of the 58 counties have developed any form of a county plan for solid waste disposal, and many of the plans which have been developed have not been adopted or implemented. Several of the existing county plans ignore consideration of the needs or plans of the incorporated cities in the county. Very few of the county plans include provisions for accommodating major industrial wastes such as cannery wastes and no county solid waste plan developed to date has considered the needs or problems of adjacent counties or cities.

(3) Inadequate Standards. There are 716 general use solid waste disposal sites now serving municipalities and the general public in the state. In addition, there are some 500 or more supplemental or "special use" sites. Over 75 percent of all of the major disposal sites inspected fell under the classification of open burning dumps. These dumps were accompanied by the usual flies, rats, smoke, odors and unsightliness. Less than 10 percent of the sites were classified as acceptable sanitary landfills. Only 17 of the 58 counties have attempted to incorporate into local ordinances some form of minimum standards for location and operation of disposal facilities. Moreover, most of the standards that have been adopted are not enforced. Lack of uniformity of standards from one area to the next was particularly apparent. What is considered a sanitary landfill by one jurisdiction is nothing more than an open dump by another jurisdiction's standards.

(4) Poorly Developed Technology. Solid waste technology is many years behind that available for the management of liquid and gaseous wastes. Almost all disposal methods now in use are forms of burning or burying. These systems are unfortunately often operated in a highly inefficient and unsanitary manner.

(5) Inadequate Financing. Many local agencies are financially unable to undertake the planning and implementation programs necessary for effective solid waste management. Collection and disposal of domestic and commercial refuse in California are now costing an estimated 300 million dollars per year. Over 20 million dollars annually are spent in just operating the 716 (largely unsatisfactory) disposal sites now in existence. When the additional amounts also spent for collection and disposal of industrial and some agricultural wastes are included, the total cost may well exceed 500 million dollars

per year.

In summary, it must be acknowledged that the management of solid wastes in California consists largely of piecemeal, uncoordinated activities, designed to meet the immediate needs of artificially segmented geographical units with little or no regard for regional planning and cooperation. The following sections summarize the principal findings from each chapter.

B. SOLID WASTE PRODUCTION

One of the primary objectives of the study was to determine or estimate the amounts and types of solid wastes produced in the state. For the purpose of this study all solid wastes produced have been grouped into three general categories: municipal wastes, industrial wastes, and agricultural wastes. The following are the major findings in regard to solid waste production.

- During 1967, approximately 71.5 million tons of solid wastes of all types were produced in California. This is broken down as:

Municipal wastes	. . . .	22.9 million tons
Agricultural wastes	. . . .	34.9 million tons
Industrial wastes	. . . .	13.7 million tons

- Based on a statewide population of 19.5 million persons, the total per capita production of solid wastes amounted to 20.2 pounds per day, broken down as:

Municipal wastes	. . . .	6.5
Agricultural wastes	. . . .	9.8
Industrial wastes	. . . .	3.9

- The five leading counties in total amount of solid wastes produced in 1967 by descending order are:

(1) Los Angeles (12,645,000 tons), (2) Fresno (3,609,000 tons), (3) San Bernardino (3,169,000 tons), (4) Tulare (2,984,000 tons), and (5) Stanislaus (2,601,000 tons).

- The breakdown by categories of the 71.5 million tons produced in California in 1967 is as follows:

Municipal Wastes	Tons	
Residential	8,866,000	
Commercial	9,717,000	
Demolition	2,988,000	
Special	1,343,000	22,914,000
Agricultural Wastes		
Manure	21,809,000	
Fruit and Nut Crops	2,361,000	
Field and Row Crops	10,731,000	34,901,000
Industrial Wastes		
Food Processing	2,127,000	
Lumber	7,993,000	
Chemical & Petroleum	464,000	
Manufacturing	3,103,000	13,687,000
	1967 Total	71,502,000

- During 1967, 19.5 million tons (27 percent) of the total amount of solid wastes produced was disposed of in the 716 major general use sites in the state. Most of this material was municipal wastes.

C. ADMINISTRATION AND CONTROL

All of the solid waste planning and operation functions and most of the regulatory controls are now transacted at the local level. There are a great number of cities, counties, and districts empowered by law to regulate solid waste management. Many of these agencies have exercised this right and have thereby developed a maze of conflicting, duplicative, inconsistent, and inadequate laws and regulations. Many of these laws have been promulgated to meet some specific crisis or have been "complaint" motivated. The fact that almost no two cities have identical laws regarding solid wastes hampers efficient collection service by both private and public agencies. The need for greater coordination of these fragmented interests for the development of sound, uniform laws and regulations is evident.

The fragmentation and inconsistency is not confined to local jurisdictions but exists at the state level as well. In California 12 different state agencies are involved to some extent in solid waste regulation. Each of these agencies has developed rather specific, narrow regulations pertaining to its own area of interest with little regard for the total system. The terms "garbage" and "refuse", for example, are defined six different ways in various state codes.

Most California code sections are aimed at such things as protecting the waters or air, preventing forest fires, protecting fish and wildlife, protecting the health of hogs, and preserving the aesthetics of highways. What is lacking, however, are solid waste laws designed specifically to protect people, their health and well-being. One of the more apparent deficiencies in existing state statutes is that no state agency has the necessary broad statutory responsibility for solid waste management. Additional pertinent findings are as follows:

- 58 counties, 399 cities, and 1,162 special-purpose districts are empowered by law to engage in solid waste management activities.
- 42 counties in California have some form of solid waste ordinance.
- 361 cities (90 percent of the cities) have enacted some form of refuse ordinance, in most cases regulating only collection of refuse.

- 5 federal agencies, not including military establishments, are directly concerned with some aspect of solid waste management.

D. SOLID WASTE COLLECTION

The greatest amount of cost in a solid waste management system is that required for the collection and transportation of the wastes from the source of production to the point of disposal. Information obtained from cities, counties, and private collectors, relative to solid waste collection and transportation, may be summarized as follows:

- Every city in California is provided with some form of refuse collection service.

- 2.2 million people (12 percent of the population) do not have refuse collection service; 1.7 million of these persons live in unincorporated areas. The remaining 500,000 are those living in cities where service is available but who do not subscribe to the service.

- Only two counties in the state have no collection service in any portion of the unincorporated areas.

- 94 cities have public agency collection of residential refuse, 9 have a combination of public and private service, and 296 have private industry collection service.

- 285 cities have a basic once-a-week collection service of residential refuse and 114 cities have twice-a-week or more refuse collection.

- Mandatory subscription to the collection service is required by 227 cities; only 4 counties require mandatory subscription in some portion of the unincorporated area.

- Back yard burning of rubbish is prohibited in 158 cities.
- There are approximately 900 refuse collection agencies operating throughout the state.
- There are 21 major refuse transfer stations in operation, handling 900,000 tons of refuse per year.

E. SOLID WASTE DISPOSAL

Solid waste disposal methods now in use in California generally involve some variation of burning or burying and in a few situations organic conversion. Agricultural wastes are disposed of primarily by spreading on land or burning. Municipal wastes are in almost all cases, disposed of by burning or burying in landfills; industrial wastes are commonly disposed of in small landfills on plant property, transported to other landfills, or burned.

All disposal sites which accept municipal-type wastes (general use sites) were inspected, evaluated, and classified according to disposal operation. Two uncontrolled disposal classifications (generally referred to as "dumps") and three controlled operation classifications (referred to as "controlled landfills") were utilized. The following are some of the major findings of the disposal site survey:

- 716 general use disposal sites are now in operation, receiving approximately 19.5 million tons of refuse per year.
- 511 disposal sites (71 percent) are burning dumps; 205 (29 percent) are controlled landfills.
- Only 67 disposal sites were rated as acceptable sanitary landfills.
- 535 sites (75 percent) are operated by public agencies. Site operation

is summarized as follows:

Counties	380
Cities	99
Districts	14
State	14
Federal	28
Private	181

- Refuse disposal sites in California contain more than 56 square miles of land. The remaining capacity in these sites is estimated to be about 719,000 acre feet (e.g., 25 square miles, 45 feet deep). These figures may be misleading, however, since only 2 percent of the sites contain 54 percent of the remaining capacity.

- 27 percent of the existing sites will be filled in less than 5 years.

- The chief need expressed by local officials in regard to solid waste management was for more disposal sites.

- While 42 of the 58 counties have ordinances concerning solid wastes, only 17 ordinances actually regulate the disposal of solid wastes.

F. ENVIRONMENTAL EFFECTS OF SOLID WASTES

Inadequate management of solid wastes may adversely affect the environment by creating a potential mode for the transmission of certain diseases by polluting the land, water and air, and by generally degrading those environmental characteristics essential to human comfort and enjoyment of life. Of these considerations, primary attention has been given to the threat that solid wastes constitute on man's health and well-being.

Domestic flies are the most prominent public health factor associated with solid wastes. Poorly managed solid wastes are also a medium for the production of other disease vectors and reservoir animals. The pollution of land has become increasingly evident in the desecretion of the fields and hillsides by open dumps, piles of automobiles, and mounds of manure, and in the frequent indiscriminant dumping of infectious and toxic wastes. Improper disposal of solid wastes may add physical, chemical, and biological pollutants to the water, causing degradation of water quality. Air pollution is an inevitable by-product when smoke, particulate matter, toxic vapors, and odors are discharged from burning dumps, burning in fields, and other inadequate burning operations. The following are some of the pertinent summary findings regarding the environmental effects of solid wastes:

- Improperly stored solid wastes and poorly operated disposal sites support large populations of flies, rodents, and other vectors of disease.
- Solid wastes pollute the land, air, and water of the state as a result of poor management practices.
- Occupational or safety hazards prevalent at disposal sites include injuries from fires and explosions, high embankments with no safety barriers, traffic hazards, and contact with hazardous wastes, such as pesticides.
- Complete daily covering (the chief deterrent to environmental problems) is provided at only 85 (12 percent) of the general use disposal sites.
- 468 disposal sites provide no covering of the refuse on a routine basis.
- Only 20 percent of the sites have effective control over blowing papers.
- 33 disposal sites were found to be discharging solid wastes directly into surface water. At 81 sites, solid wastes are in contact or appear to be in contact with ground waters. 207 sites have not made adequate provisions for control of surface water drainage.

- 540 disposal sites in 51 counties contribute to smoke, odor, and air pollution problems through open burning of refuse.
- More than 250 fires, requiring the use of outside fire control equipment, originated from refuse disposal sites during 1967.

G. SOLID WASTE PLANNING - CURRENT STATUS

One major deficiency in solid waste management in California is the lack of adequate planning at all levels of government. Few plans have been developed for the future, and present action is stimulated primarily by impending crises. Authority in solid waste management is fragmented and cooperation is lacking. A mechanism is needed for stimulating planning for solid waste management on a rational geographical basis, coordinated to insure escalation of standards of environmental quality. Some of the findings regarding the status of planning are as follows:

- Only 16 of the 58 counties have undertaken any solid waste study or planning activities. These have generally been incomplete studies. No county at the present time has a complete solid waste management plan. Deficiencies of existing plans include lack of planning for the entire county, for the entire waste loading, and for reasonable projection of future requirements.
- While 25 counties export some refuse to other areas, no county plan has properly considered the needs or problems of adjacent areas.
- Responsibility for local solid waste planning programs generally rests with the public works or engineering departments. County planning departments have this responsibility in 7 of the 58 counties.

III. SOLID WASTE PRODUCTION

In reviewing various reports it is noted that many estimates of solid waste production have been utilized and quoted. Almost all of these estimates have been based on "rule-of-thumb" measurements such as four pounds per capita per day. These estimates rarely defined what types of wastes were included and almost never included all solid wastes.

One of the primary objectives of this study was to attempt to determine, on a rational basis, the magnitude of the total solid waste production in California. In this study, solid waste production was evaluated and analyzed under the three major waste categories of municipal wastes, industrial wastes and agricultural wastes. The following are examples of the types of waste material under these categories:

(1) Municipal Wastes

- (a) Residential wastes:

    Household garbage and rubbish
    Lawn clippings and prunings
    Furniture, appliances, and miscellaneous items

- (b) Commercial wastes:

    Refuse from stores, markets, offices and shopping centers
    Refuse from schools, churches, hospitals, public buildings, airports, etc.

- (c) Demolition and construction wastes

- (d) Special wastes:

    Street refuse (sweepings, leaves, tree trimmings)

Sewage treatment residue (sludge and screenings)
Dead animals (dogs, cats, etc.)
Automobile bodies

(2) Agricultural Wastes

(a) Livestock manure

(b) Fruit and nut crop wastes

(c) Field and row crop wastes

(3) Industrial Wastes

(a) Food processing wastes

(b) Lumber industry wastes (sawmills, planing mills, logging)

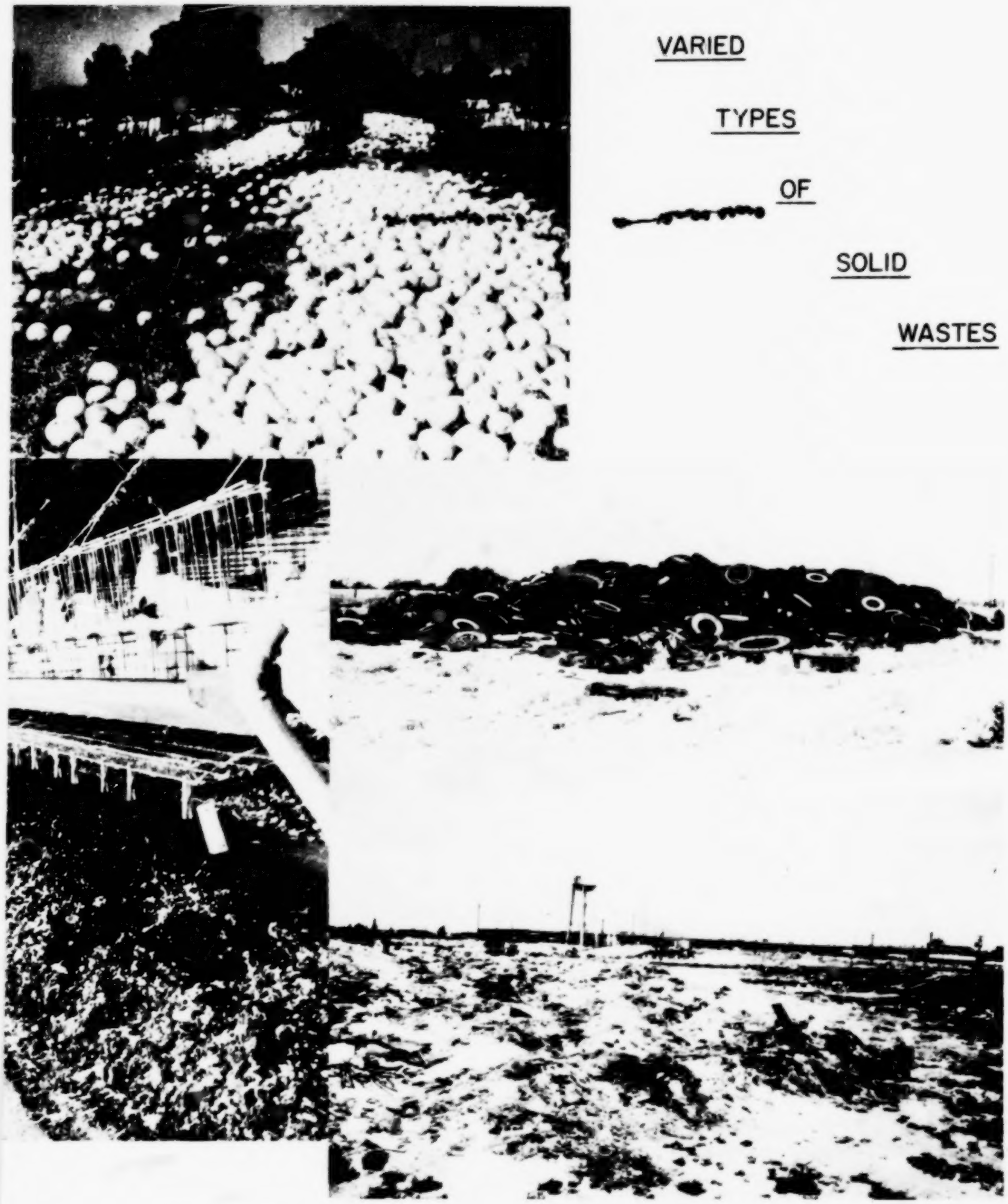
(c) Chemical and petroleum industry wastes

(d) Manufacturing wastes

In determining quantities of wastes, an effort has been made in this chapter to estimate the amount of wastes "produced" as distinguished from the amount of wastes "disposed of" in landfills or other disposal sites. A considerable amount of waste material generated in any area never actually finds its way to a disposal site under current practices. Procedures such as back yard burning of residential refuse, on-site disposal of industrial wastes, field disposal of agricultural wastes, incineration, grinding to sewers, etc., create the differential between waste "production" and "disposal". The quantity of wastes delivered to general use sites is presented in Chapter VI.

In estimating quantities of wastes produced, considerable use was made of waste generation or production factors. These factors generally relate the average quantity of wastes produced over a specific period of time to a basic unit of production. In the municipal waste segment, factors such as pounds-per-person-per-day were utilized. For agriculture, the factors utilized were pounds-per-animal-per-year for manure or tons-per-acre-per-year for crop wastes. Factors for industrial wastes were usually related to the number of

VARIED TYPES OF SOLID WASTES



Stockpiling of large quantities of food processing wastes.

employees or expressed as a percentage of raw material processed (on a weight basis) or on a tonnage per production unit. The methodology utilized to determine quantities of solid wastes produced is discussed further in this chapter.

A. TOTAL QUANTITIES OF SOLID WASTES PRODUCED

As indicated in the introduction to this chapter, attention has been directed to sources and quantities of waste generation rather than to that merely collected or disposed of in traditional manner. In order to establish a sound basis upon which to establish effective plans and programs, reliable forecasts of solid waste quantities are needed. A survey of the quantities of solid waste collected or accepted at disposal sites provides an insufficient basis for making future projections. Solid waste quantities when related to specific sources of generation, provide a better basis for future projections. Advantages of this method are that it takes into account: (a) different growth rates of various sources of waste generation; (b) technological changes affecting specific sources and types of wastes; (c) more detailed information concerning the various streams of wastes (e.g., waste factors can be developed for specific sources).

It should also be recognized that only a portion of the total solid waste production can be directly attributed to the density of population in a given area or region. Certain specific wastes such as residential garbage and rubbish, commercial wastes, demolition wastes and sewage residue are directly proportional to population density and increase or decrease in direct proportion to the population. Wastes such as agricultural manure, crop wastes, industrial processing wastes are not related to population but are reflected by the economy and physical characteristics of a region. These wastes cannot be realistically expressed as a function of population density on a per capita basis. The quantities of waste expressed in this chapter are shown as total quantities according to category. Per capita figures are reflected in some cases for comparison purposes only.

During 1967, total solid waste production in California amounted to a total of 71,502,000 tons. Of this total 32.0 percent (22,914,000 tons) was municipal waste, 48.8 percent (34,901,000 tons) was agricultural waste and 19.2 percent (13,687,000 tons) was industrial waste. The amount of solid wastes produced by each county is listed by categories in Table III-1. The ranking of each county, according to the total amount of wastes produced, is also shown. Somewhat surprising was the fact that Los Angeles, Fresno, San Bernardino, Tulare and Stanislaus counties lead the state in total amounts of solid waste produced.

Chapter VI is a discussion of solid waste disposal in California. As indicated in that chapter, only 19,474,600 tons per year or about 27 percent of all of the solid wastes produced in California finds its way to general use disposal sites. Much of the reason for this, of course, is due to the fact that agricultural waste is normally disposed of at the source. Municipal and industrial wastes are the wastes which normally are amenable to disposal through traditional solid waste disposal facilities. It was found, however, that only about 53 percent of the municipal and industrial wastes are actually disposed of in the 716 general use disposal sites in the state. This would indicate that considerable amounts of these types of wastes are handled and disposed of by other means. An example is lumber industry wastes (7,993,000 tons), which are either left in the forest or burned in "teepee burners".

A general rule-of-thumb factor of 4 or 4½ pounds per person per day has frequently been quoted and has been accepted as a national average for solid waste production. For comparison purposes, the more than 71 million tons of solid wastes produced annually in California by a population of almost 20 million persons represent a production factor of 20.2 pounds per person per

TABLE III-1

TOTAL SOLID WASTE PRODUCTION

County	Municipal Tons/Year	Industrial Tons/Year	Agricultural Tons/Year	Annual Total Tonnage	Rank in State
Alameda	1,347.000	388,000	125,000	1,860,000	15
Alpine	< 1.000	3,000	<1,000	3,000	58
Amador	10,000	62,000	15,000	87,000	54
Butte	90,000	114,000	456,000	660,000	30
Calaveras	10.000	84,000	11,000	105.000	53
Colusa	11.000	0	540,000	551,000	35
Contra Costa	549.000	253.000	378,000	1,180,000	21
Del Norte	13,000	372,000	33,000	418,000	38
El Dorado	40,000	318,000	19.000	377.000	40
Fresno	479,000	254,000	2,876,000	3.609,000	2
Glenn	16.000	53,000	526,000	595,000	33
Humboldt	101,000	1.802,000	250,000	2,153,000	12
Imperial	79,000	9.000	2,493,000	2,580,700	6
Inyo	12,000	1,000	11,000	23,000	56
Kern	322,000	82,000	2.117,000	2,521.000	7
Kings	60,000	15,000	1,396,000	1.471.000	17
Lake	15,000	69.000	43,000	127.000	52
Lassen	14,000	147,000	28,000	189,000	49
Los Angeles	8,985.000	1,881,000	1,779,000	12,645,000	1
Madera	41,000	107.000	635.000	783.000	27
Marin	196.000	9,000	313.000	518,000	36
Mariposa	4,000	10,000	42,000	56,000	55
Mendocino	45.000	901,000	89,000	1,035,000	23
Merced	102,000	15,000	2,101,000	2,218,000	11
Modoc	7.000	92,000	77,000	176,000	50
Mono	4.000	0	2,000	6,000	57
Monterey	240,000	73,000	777,000	1,090.000	22
Napa	74.000	6,000	140,000	220,000	46
Nevada	21,000	102,000	18,000	141,000	51
Orange	1,557,000	223.000	456,000	2,236,000	9
Placer	66.000	198.000	91,000	355,000	41
Plumas	10,000	364,000	5,000	379,000	39
Riverside	483.000	88,000	1.539,000	2,110,000	13
Sacramento	733.000	73,000	847,000	1,653,000	16
San Benito	14,000	5.000	175,000	194,000	48
San Bernardino	714,000	920,000	1,535,000	3,169,000	3
San Diego	1,559.000	107,000	741,000	2,407,000	8
San Francisco	1.071.000	122,000	0	1,193,000	20
San Joaquin	277,000	182.000	1,773,000	2,232,000	10
San Luis Obispo	95,000	8,000	457.000	560.000	34
San Mateo	589,000	99,000	29,000	717,000	29
Santa Barbara	245,000	39.000	328,000	612,000	32
Santa Clara	1,174,000	343,000	387,000	1,904,000	14
Santa Cruz	100.000	142,000	97,000	339,000	42
Shasta	70,000	659.000	153,000	882,000	24
Sierra	2,000	208,000	2,000	212,000	47
Siskiyou	30,000	687,000	157,000	874,000	26
Solano	173,000	41,000	511,000	725,000	28
Sonoma	167,000	216,000	915,000	1,298,000	18
Stanislaus	168,000	156,000	2,277,000	2,601,000	5
Sutter	36,000	16,000	577,000	629,000	31
Tehama	26,000	288.000	152,000	466,000	37
Trinity	8.000	260.000	2,000	270,000	44
Tulare	173.000	182,000	2,629,000	2,984,000	4
Tuolumne	17,000	310,000	8,000	335,000	43
Ventura	353.000	68,000	820,000	1,241,000	19
Yolo	77,000	31,000	769,000	877,000	25
Yuba	40,000	38,000	180,000	258,000	45
Additional Statewide		392,000		392,000	
Total[1]	22,914.000	13,687,000	34,901,000	71,502,000	

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[1] The data in this and the following tables may not balance due to errors inherent in maintaining significant figures.

day. This per capita figure breaks down into 6.5 pounds per day of municipal waste, 9.8 pounds per day of agricultural waste, and 3.9 pounds per day of industrial waste.

B. DISCUSSION OF WASTE PRODUCTION BY CATEGORY

A discussion of the waste production categories and the methods used to estimate quantities of wastes produced is presented in the following sections.

1. MUNICIPAL WASTES

In addition to being attributable to population, some types of municipal wastes are also related to or dependent upon the density of the population. This is particularly true of commercial and demolition wastes. In other words, the more "urban" or built-up an area may be, the more stores, shopping centers, department stores, offices, etc., located in that area. Urban renewal and razing of old structures for new construction is more prevalent in larger urban cities than small communities. For these reasons, the entire state's population was divided into population groupings. Waste production factors were then established for each population density grouping for commercial, demolition and special wastes. Each population center, whether it was an incorporated city or located in unincorporated areas, was grouped into one of the following categories:

Less than 1,000 persons
1,000 - 10,000 persons
10,000 - 100,000 persons
More than 100,000 persons

In the case of metropolitan areas, the populations used were those of the cities plus high density unincorporated areas surrounding the cities. The population living in other unincorporated areas were categorized by communities or other density area. Scattered persons or small villages were placed in the less than 1,000 group.

The factors used in this study were based upon an analysis of data gathered by the Department during previous studies: the California Solid Waste Planning Study, the Fresno Integrated Solid Wastes Study, data provided by other state and local agencies and miscellaneous published reports.

Table III-2 presents the total amount of municipal wastes generated in California during 1967, listed by the various categories. Once again it should be pointed out that this represents the quantity of wastes "produced" not necessarily the quantity collected or taken to disposal sites. As indicated in the table, almost 23 million tons of municipal wastes representing 6.5 pounds per capita per day were generated in 1967.

The column indicating "applicable population" refers to the total population to which the appropriate waste production factor was applied. In this regard residential wastes were found to be very consistent and did not appear to fluctuate significantly with the size of the community. The factor for residential wastes, therefore, was applied to the total population. Commercial wastes varied according to population density and are reflected as such. Demolition and construction wastes were applied only to population densities greater than 1,000 persons and according to grouping. Inasmuch as street cleaning, etc., is routinely performed primarily in cities, the factor for street refuse was applied only to population living in incorporated cities or large metropolitan areas (the total for state highways is added in separately). The sewage treatment residue factor was applied only to population groups more than 1,000 persons.

One specific material which is sometimes considered as solid waste is junked or abandoned automobile bodies. Without question, in many parts of the state, automobile bodies are definitely a waste product with many

TABLE III-2

STATEWIDE MUNICIPAL WASTE PRODUCTION

	Applicable Population	Waste Generation Factor	Annual Total Tonnage
Residential Waste			
Countywide Average	19,432,620	2.5 lb/capita/day	8,866,100
		Subtotal	8,866,100
Commercial Waste			
< 1,000	1,722,770	1.5 lb/capita/day	471,600
1,001 - 10,000	1,928,050	2.0 lb/capita/day	703,700
10,001 - 100,000	8,433,500	2.5 lb/capita/day	3,847,800
> 100,000	7,348,300	3.5 lb/capita/day	4,693,700
		Subtotal	9,716,800
Demolition Waste			
1,000 - 10,000	1,928,050	100 lb/capita/yr.	96,400
10,001 - 100,000	8,433,500	250 lb/capita/yr.	1,054,200
> 100,000	7,348,300	500 lb/capita/yr.	1,837,100
		Subtotal	2,987,700
Special Waste			
Street Refuse	14,412,080	120 lb/capita/yr.	864,700
Sewage Residue	17,709,850	54 lb/capita/yr.	478,200
		Subtotal	1,342,900
		TOTAL	22,913,500

TABLE III-3

MUNICIPAL SOLID WASTE PRODUCTION

County	Residential Tons/Year	Commercial Tons/Year	Demolition Tons/Year	Special Tons/Year	Annual Total Tonnage	Ranking in State
Alameda	477,900	582,100	202,000	84.900	1,347.000	4
Alpine	200	100	0	0	< 1,000	58
Amador	5,300	3,600	200	500	10,000	50
Butte	46,300	35,300	4,600	3,600	90,000	27
Calaveras	5,600	3,700	200	200	10,000	50
Colusa	5,800	4.100	300	500	11,000	49
Contra Costa	241,800	222.100	50,900	34,000	549.000	10
Del Norte	7,300	4,900	300	300	13,000	47
El Dorado	21,900	15.100	1,000	1,800	40,000	36
Fresno	191,600	203,900	60,200	23,000	479,000	12
Glenn	8,700	6,300	600	800	16,000	43
Humboldt	52,600	39,300	5,000	4,200	101,000	24
Imperial	37,000	31,300	6,000	5,000	79,000	28
Inyo	6,800	4,800	400	400	12,000	48
Kern	155,100	129,200	24,000	13,500	322,000	14
Kings	31,000	23,700	3,300	2,400	60,000	33
Lake	8,700	5,500	200	300	15,000	44
Lassen	7,900	5,500	400	600	14,000	45
Los Angeles	3,214,200	3,883,500	1,338,800	548,200	8,985,000	1
Madera	20,400	15.900	2,500	1.900	41,000	35
Marin	89,900	78.100	15,200	12,900	196,000	18
Mariposa	2,700	1.600	0	0	4,000	55
Mendocino	24,600	17,000	1,200	1.800	45,000	34
Merced	49,100	40,400	7.300	4.900	102,000	23
Modoc	3,800	2,500	100	200	7,000	54
Mono	2,200	1,300	0	0	4,000	55
Monterey	109,500	96,600	20,800	13,400	240,000	17
Napa	34,900	29.900	5,600	4,100	74,000	30
Nevada	11,600	8,000	600	800	21,000	41
Orange	589,000	658,200	208.400	101,800	1,557,000	3
Placer	34,300	25,600	3,200	2.900	66,000	32
Plumas	5,400	3.900	400	300	10,000	50
Riverside	202,800	201.000	53.100	25.700	483,000	11
Sacramento	289,700	315.700	96.300	31,200	733,000	7
San Benito	7,800	5,500	400	800	14,000	45
San Bernardino	304,600	296,000	75.800	37,500	714,000	8
San Diego	571,000	671.600	224.000	92.400	1,559,000	2
San Francisco	341,300	477,800	187.000	65,100	1,071,000	6
San Joaquin	127,200	111,300	22.900	15,600	277,000	15
San Luis Obispo	45,900	37,100	5.900	5.900	95,000	26
San Mateo	246,600	238,800	61,700	42,000	589,000	9
Santa Barbara	114,000	98,100	19.800	13.400	245,000	16
Santa Clara	423,100	508,100	173,100	70,000	1,174,000	5
Santa Cruz	48,500	39.500	6.600	5,100	100,000	25
Shasta	37,100	27,100	3,100	2,300	70,000	31
Sierra	1,100	700	0	100	2,000	57
Siskiyou	16,100	11,600	1,000	1.700	30,000	39
Solano	72,900	69,600	17.500	13,100	173,000	19
Sonoma	83,800	65,200	9,800	7.800	167.000	22
Stanislaus	83,100	66,300	10,500	7.900	168.000	21
Sutter	18,200	14.400	2.200	1.600	36,000	38
Tehama	13,700	9.800	800	1,200	26,000	40
Trinity	4,300	2,900	200	100	8,000	53
Tulare	88,000	68,000	9,800	7,400	173,000	19
Tuolumne	9,900	6,600	400	400	17,000	42
Ventura	157,300	143.700	32,500	20,000	353.000	13
Yolo	34,200	31,600	7,500	4,200	77,000	29
Yuba	20,800	15,800	2,100	1,400	40,000	36
Total	8,866,000	9,717.000	2,988,000	1,343,000	22,914,000	

associated environmental and disposal problems. This is particularly true in the rural parts of Northern California, where abandoned autos appear along roads, streams, ravines and public refuse disposal sites. These constitute aesthetic eyesores as well as presenting disposal problems to public officials. The large majority of junked automobile bodies in California, however, are salvaged as scrap metal. These auto hulks have value in the large metropolitan areas. In the Los Angeles area, for example, many hundreds of thousands of these are processed annually into scrap metal. The "problem", therefore, is primarily one of location and handling of these bodies.

Because of the fact that automobile bodies are not considered as wastes in many areas of California at the present time due to their salvage value, the quantity of this material is not included in municipal waste production as described in this chapter. Any solid waste planning agency, however, should consider this material on an individual basis to determine its present and future status and its method of handling and disposal.

Table III-3 shows the municipal waste production by counties and general category.

2. AGRICULTURAL WASTES

Agricultural wastes consist primarily of animal manures, residue from harvested field crops, and prunings and residue from fruit and nut orchards. The waste generation factors for agricultural wastes are not related to population but are reflected in terms of the amount of wastes produced by each type of source.

The agricultural waste survey included interviews with state and local agencies, agricultural commissioners, local farm advisors, University of California and others to obtain data relative to wastes from agricultural activities. From these data and other published reports, the amounts of wastes originating from unit agricultural activities were determined.

In the category of manure, only those animals which are confined, such as in corrals, pens, or houses, were considered as waste sources. Pastured or range animals were excluded since wastes from these animals are not, in a practical sense, subject to "management" The amounts of animal manures were estimated by determining the number of animals of each type for each county and applying the appropriate waste production factor. In this report the waste factor represents manure in a wet condition as produced.

County agricultural crop reports were utilized to determine the acreage of each type of waste-producing crop. Inasmuch as several crops were subject to approximately the same waste production factor, these crops were grouped together and designated as Class 1 through 5. The following is a listing of the classes and the type of crops in each class.

(1) Fruit and Nut Crops

Class 1	Grapes, peaches, nectarines
Class 2	Apples, figs, pears
Class 3	Plums, apricots, quince
Class 4	Almonds, olives, avocados and all miscellaneous fruits or nuts
Class 5	Walnuts, prunes, citrus, cherries, dates

(2) Field and Row Crops

Class 1	Field and sweet corn (not silage corn)
Class 2	Cauliflower, lettuce and broccoli
Class 3	Rice, sorghum, cantaloupes, tomatoes, melons, sugar beets, cabbage, squash, brussels sprouts
Class 4	Beans, onions, cucumbers, carrots, peas, peppers, potatoes, garlic, peanuts, cotton, celery, and all miscellaneous vegetables
Class 5	Barley, oats, wheat, milo, safflower, asparagus

The sum total acreage for each class was multiplied by the appropriate

TABLE III-4

STATEWIDE AGRICULTURAL WASTE PRODUCTION

	Number of Applicable Units	Waste Production Factor	Annual Total Tonnage
Manures			
Chickens (Fryers)	99,977,770 birds	4.5 tons/1000	449,900
Hens (Layers)	37,797,900 birds	47 tons/1000	1,776,500
Hogs	193,300 head	1.75 tons/head	338,300
Beef Cattle (feedlot)	1,078,700 head	7.5 tons/head	8,090,800
Dairy Cattle	857,930 head	13 tons/head	11,153,100
		Subtotal	21,809,000
Fruit and Nut Crops			
Class 1	557,320 acres	2.5 tons/acre	1,393,300
Class 2	77,330 acres	2.25 tons/acre	174,000
Class 3	59,300 acres	2.0 tons/acre	118,600
Class 4	12,670 acres	1.5 tons/acre	190,000
Class 5	484,900 acres	1.0 tons/acre	484,900
		Subtotal	2,361,000
Field and Row Crops			
Class 1	230,360 acres	4.5 tons/acre	1,036,600
Class 2	170,650 acres	4.0 tons/acre	682,600
Class 3	944,030 acres	3.0 tons/acre	2,832,100
Class 4	897,300 acres	2.0 tons/acre	1,794,600
Class 5	2,923,670 acres	1.5 tons/acre	4,385,500
		Subtotal	10,731,000
		TOTAL	34,901,000

TABLE III-5

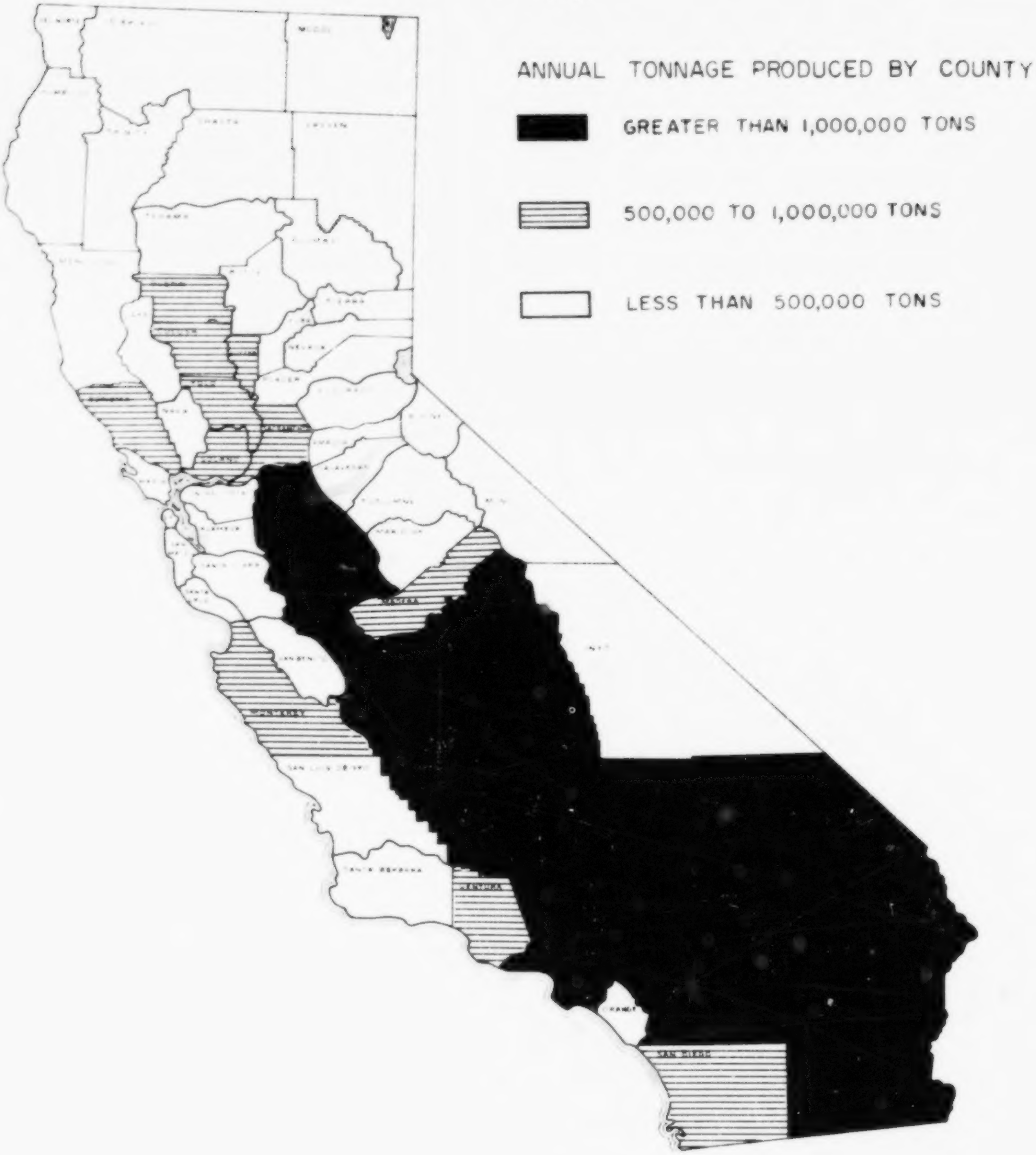
AGRICULTURAL SOLID WASTE PRODUCTION BY COUNTY

County	Manures Tons/Year	Fruit & Nut Crop Waste Tons/Year	Field & Row Crop Waste Tons/Year	Annual Total Tonnage	Rank in State
Alameda	58,900	8,300	57,500	125,000	37
Alpine	0	0	100	<1,000	57
Amador	10,900	2,000	1.700	15,000	49
Butte	86,900	43,000	326,200	456,000	24
Calaveras	8,400	1,800	0	10,000	51
Colusa	46.600	15,800	477,700	540,000	20
Contra Costa	247.200	30,200	100,200	378,000	27
Del Norte	33,000	0	0	33,000	44
El Dorado	12,300	6,400	0	19,000	47
Fresno	1.014,000	519,300	1,342,400	2,876,000	1
Glenn	229,700	11,100	285,400	526,000	21
Humboldt	248,400	100	1,900	250.000	30
Imperial	1,676,500	1,500	814,700	2,493.000	3
Inyo	10,200	0	300	11,000	50
Kern	1,422,400	106,600	588,100	2.117,000	5
Kings	719.700	20.200	656,300	1,396,000	11
Lake	19.600	22,200	1.500	43.000	42
Lassen	10,500	0	17,000	28,000	46
Los Angeles	1,687.900	11,000	80,500	1.779,000	7
Madera	270,100	100,000	265,000	635,000	18
Marin	312,200	100	800	313,000	29
Mariposa	40,900	400	600	42,000	43
Mendocino	56.700	26,500	3,700	89,000	40
Merced	1,648,300	85.700	366,700	2,101,000	6
Modoc	13,000	0	64,300	77,000	41
Mono	1.300	100	100	2,000	54
Monterey	213.800	5.500	557.500	777,000	15
Napa	100,700	37,000	2.000	140,000	36
Nevada	17.700	600	0	18,000	48
Orange	361.600	19.100	74.900	456,000	24
Placer	40,800	11.500	38,500	91,000	39
Plumas	3.200	0	2,000	5,000	53
Riverside	919,200	74.900	545,100	1,539,000	9
Sacramento	494,700	14.600	338,100	847,000	13
San Benito	97,900	23,900	53,500	175,000	32
San Bernardino	1,457,500	64.200	13,500	1,535,000	10
San Diego	664,000	27,300	49,800	741,000	17
San Francisco	0	0	0	0	58
San Joaquin	941,600	193.200	638,500	1,773.000	8
San Luis Obispo	182.600	13,200	261.300	457,000	23
San Mateo	25.500	0	3.800	29,000	45
Santa Barbara	181.600	11,000	135,600	328,000	28
Santa Clara	237,400	72.400	77,100	387,000	26
Santa Cruz	39,200	19,900	37,500	97.000	38
Shasta	144,600	2.100	6,200	153,000	34
Sierra	1,500	0	700	2,000	54
Siskiyou	62,900	0	94,400	157,000	33
Solano	257,200	28,000	225.400	511,000	22
Sonoma	834,000	70,200	10,600	915,000	12
Stanislaus	1,883,800	150,300	243.100	2.277,000	4
Sutter	52,200	69.300	455,800	577,000	19
Tehama	91,600	18,900	41,800	152,000	35
Trinity	1,600	0	0	2,000	54
Tulare	1.796.200	299,800	533,400	2,629,000	2
Tuolumne	7.000	1.100	200	8,000	52
Ventura	618.700	67,700	134.000	820,000	14
Yolo	97,800	25.100	646,200	769,000	16
Yuba	95.600	26,000	58,200	180,000	31
Total	21,809,000	2.361.000	10,731.000	34,901,000	

FIGURE III-1

DISTRIBUTION OF AGRICULTURE WASTES

-1967-


ANNUAL TONNAGE PRODUCED BY COUNTY
■ GREATER THAN 1,000,000 TONS
▤ 500,000 TO 1,000,000 TONS
□ LESS THAN 500,000 TONS
SAN BENITO
SAN LUIS OBISPO
SANTA BARBARA
SAN DIEGO

CALIF DEPT. OF
PUBLIC HEALTH

waste factor per acre to estimate the total waste produced. For fruit and nut crops, non-bearing acreage was excluded although it is recognized that some considerably lesser amount of wastes may be associated with this acreage. The waste production factors shown in Table III-4 were derived primarily from other published reports: the University of California, Agriculture Extension Service and by Departmental studies in Fresno County.

As indicated in Table III-4, a total of 34,901,000 tons of agricultural wastes were produced in California in 1967. The major portion (62.5 percent) of these wastes consisted of animal manure. In addition to representing the greatest amount of agricultural wastes produced, the manures also cause some of the more critical environmental problems. As might be expected, the major agricultural waste-producing counties are located in the San Joaquin and Imperial Valley. The five leading counties in terms of agricultural waste production are Fresno, Tulare, Imperial, Stanislaus, and Kern. The amounts of agricultural wastes generated by counties are shown in Table III-5 and the distribution of the major producers is shown on Figure III-1.

3. INDUSTRIAL SOLID WASTES

a. General Procedure

The industrial waste section is presented in greater detail than the other categories. This was done because less published data are available for this category and additional detail was needed to explain the development of industrial solid waste data.

In the analysis of industrial wastes, by-products presently being utilized (e.g., slag from some steel mills and some residue from sawmills) were excluded. These quantities are not reported in the totals presented in this chapter.

The data on quantities of industrial solid wastes produced in California were determined from field surveys (interviews), mail surveys, and the application of waste production factors to employment data and production data. Sources of data included special studies by this Department, information from local, state, and federal agencies, and particularly information from industry. Information from private industry was obtained both directly from industrial companies and through industrial trade associations. Special industrial solid waste surveys were conducted in cooperation with this study by the National Canners Association, the National Frozen Food Association, the Chemical Industrial Council of Northern California, and the Western Oil and Gas Association. Useful information was also provided by the Bay Area League of Industrial Associations, the California Manufacturers Association, the State Chamber of Commerce, the U.S. Forest Service, and the Agricultural Extension Service of the University of California.

The Standard Industrial Classification (SIC),1/ developed by the federal government, was utilized for the classification of establishments in California according to type of activity. More detailed information on the SIC code and its utilization by this study is presented in Appendix A. The industrial wastes considered in this report with the exception of wastes from industries designated by SIC Codes 0715, 0716, 5040 and 5041 (fresh pack of fruits and vegetables) were limited to those industries within Division D, designated by the SIC Manual as "manufacturing". These were considered to constitute the major waste producers in terms of industrial processing wastes.

Employment data from the 1967 County Business Patterns2/ were used for all Standard Industrial Classifications except seasonal industries. This publication reports employment data tabulated in terms of "reporting units", with each

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1/ U.S. Bureau of the Budget, Standard Industrial Classification Manual 1967, (Washington: U.S. Government Printing Office, 1967).
2/ U.S. Bureau of the Census, County Business Patterns 1967, California CBP-67-6, (Washington: U.S. Government Printing Office, 1968).

manufacturing location of an industry counted as a separate reporting unit. Therefore, in manufacturing industries "units" are similar to "establishments" reported by the U.S. Census Bureau in the Census of Manufacturers.[3] This is an important fact because it means that data such as "value added by manufacture" and "value of shipments" can be used in the development of waste production factors. During this study, data from the 1963 Census of Manufacturers were also used to a limited extent.

It should be noted that employment data in the 1967 County Business Patterns are the count of employees on the payroll as of March 12, 1967. Therefore, special care must be taken when waste factors relating to the number of employees are applied to industries with seasonal employment, such as food processing. In this study, for example, although the quantities on fresh pack of fruits and vegetables were estimated by the application of waste production factors applied to the number of employees, monthly employment data were obtained from the California Department of Employment and the factor was based on man/months instead of man/years. Data on cannery wastes were obtained from a statewide survey of actual wastes produced, conducted by the National Canners Association for this Department.

It is recognized that much additional work must be done in the field of industrial solid wastes to develop better factors and to determine the ultimate disposition of all of the types of industrial wastes. The industrial waste data gathered during the development of this report are comprehensive for the food processing, lumber, and chemical and petroleum categories. The factors used for the manufacturing category are based on estimates, and additional work needs to be done in this area.

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[3] U.S. Bureau of the Census, 1963 Census of Manufacturers, California-Area Statistics MC 63(3)-5, (Washington: U.S. Government Printing Office, 1966)

b. Total Quantities of Wastes

During 1967, an estimated 13,687,000 tons of industrial wastes were produced in California. As shown in Table III-6, these wastes are composed of four major groups: food processing (2,127,000 tons); lumber (7,993,000 tons); chemical and petroleum (464,000 tons); and manufacturing (3,103,000 tons). These four major groups are discussed individually later in this chapter. Also in Table III-6 is the quantity of wastes produced by each subgroup, shown by its Standard Industrial Classification.

In Table III-7, Industrial Solid Waste Production, the quantity of industrial solid wastes for each group by county is shown. Also in Table III-7 is a county-by-county tabulation of total industrial solid wastes.

The ten counties with the greatest industrial solid waste production are listed in Table III-8. This table lists counties by total industrial wastes and by industrial wastes with lumber wastes excluded.

The right-hand figures are presented because lumber industry wastes could almost be considered a separate type of waste, lying somewhere between agricultural and industrial wastes. Hence, its production is not indicative of the "industrial" nature of the counties in the traditional sense.

c. Discussion of Major Types of Industrial Wastes

(1) Food Processing Wastes

As was shown in Table III-6, an estimated 2,127,000 tons of food processing wastes were produced in California during 1967. Food processing wastes are a major concern, not only because of the large quantities produced, but because of the potential for environmental pollution. Due to the organic and highly putrescible nature of food processing wastes, a major problem associated with its disposal is its great capacity to act as a breeding media for the production of flies. Water and air pollution (in the form of obnoxious odors) are

TABLE III-6

INDUSTRIAL SOLID WASTE PRODUCTION - 1967
Statewide Totals by SIC Classification

SIC CODE	TYPE OF WASTE	SOLID WASTE TONNAGE	
	Food Processing Wastes		
Misc. Codes	Fruit and Vegetable Fresh Pack	409,500	
201	Meat Processing	100,000	
2033	Cannery	750,000	
2037	Frozen Foods	170,000	
Other 203	Other Preserved Foods	197,500	
Other 20 Series	Misc. Food Processing	500,000	
	Sub-Total		2,127,000
	Lumber Industry Wastes		
2411	Logging Debris	4,956,900	
2421	Sawmills and Planing Mills	3,036,400	
	Sub-Total		7,993,000
	Chemical and Petroleum Industry Wastes		
28	Chemical and Allied Products	126,800	
29	Petroleum Refining and Related Industries	336,800	
	Sub-Total		464,000
	Manufacturing Wastes		
	Heavy Manufacturing		
19	Ordinance	54,600	
33	Primary Metals	1,307,600	
34	Fabricated Metals	181,000	
35	Machinery (other than electrical)	332,200	
36	Electrical Machinery and Equipment	346,100	
37	Transportation Equipment	324,900	
	Light Manufacturing		
22	Textile Mill Products	2,500	
23	Apparel, etc.	21,000	
24	Wood Products (except 2411 and 2421)	203,000	
25	Furniture	16,800	
26	Paper and Allied Products	63,500	
27	Printing, publishing	41,300	
30	Rubber and Plastic	96,600	
31	Leather	1,000	
32	Stone, Clay	104,100	
38	Professional and Scientific Inst.	3,400	
39	Misc. Manufacturing	3,800	
	Sub-Total		3,103,000
	Total Industrial Wastes		13,687,000

TABLE III-7

INDUSTRIAL SOLID WASTE PRODUCTION[1/]

County	Food Processing Tons/Year	Lumber: Logging Debris Tons/Year	Lumber: Sawmill and Planing Mills Tons/Year	Chemical and Petroleum Tons/Year	Manufacturing: Heavy Tons/Year	Manufacturing: Light Tons/Year	Annual Total Tonnage	Rank in State
Alameda	151,900		16,700	11,000	155,900	52,900	388,000	7
Alpine		3,000					3,000	55
Amador		11,400	50,200				62,000	40
Butte	12,800	48,000	50,200		1,000	2,200	114,000	27
Calaveras		50,500	33,500				84,000	34
Colusa							0	58
Contra Costa	19,100			152,100	73,300	8,900	253,000	16
Del Norte		238,200	126,000			7,400	372,000	8
El Dorado		232,900	84,600				318,000	11
Fresno	121.700	88,000	16,700	6,700	13,400	7,200	254,000	15
Glenn	2,400	51.000					53,000	41
Humboldt	3,600	1,215.300	551,400		4,000	27,300	1,802,000	2
Imperial	9.000						9,000	51
Inyo						1,000	1,000	56
Kern	33,400	20,000		13,600	13,600	1,100	82,000	35
Kings	4,600			5,600		4,900	15,000	47
Lake	2,700	66,000					69,000	38
Lassen		111.000	36,300				147,000	24
Los Angeles	340,700		64.100	230,300	985,600	260,400	1,881,000	1
Madera	3,000	70,300	34,100				107,000	28
Marin	1,000				4,800	3,100	9,000	49
Mariposa		10,000					10,000	50
Mendocino	500	474,700	419,300		800	5,800	901,000	4
Merced	14,900				400	100	15,000	47
Modoc		91,800					92,000	31
Mono							0	58
Monterey	63,600			100	2,800	6,200	73,000	36
Napa	2,800				3,000	200	6,000	53
Nevada		58,800	42,900				102,000	29
Orange	86,300			3,400	105,800	27,100	223,000	17
Placer	3,300	113,200	80,800			400	198,000	20
Plumas		221,300	142,100				364,000	9
Riverside	45,000			5,000	29,200	8,400	88,000	32
Sacramento	55,100			100	9,600	8,300	73,000	36
San Benito	4,500				500		5,000	54
San Bernardino	44,000	10,000	25,300	2,000	834,800	4,400	920,000	3
San Diego	35.300			3,700	59,900	7,900	107,000	33
San Francisco	60,900			2,400	45,200	13,700	122,000	26
San Joaquin	123,000		33,500	200	12,500	12,800	182,000	21
San Luis Obispo	6,000			1,000		800	8,000	52
San Mateo	19,300	23,700		5,800	45.100	4,800	99,000	30
Santa Barbara	28,300			1,300	9,100	600	39,000	43
Santa Clara	230,000			7,700	89,800	15,800	343.000	10
Santa Cruz	52,600	18,200	66.600		4,600	500	142,000	25
Shasta	400	419,900	227,600			11,400	659,000	6
Sierra		165.600	42,000				208,000	19
Siskiyou	2,100	465,400	194,800			24,500	687,000	5
Solano	39,800				1,000	200	41,000	42
Sonoma	42,200	69.300	92,200		3,700	8,900	216,000	18
Stanislaus	146,000			1,600	3,900	4,600	156,000	23
Sutter	13,800					2,700	16,000	46
Tehama	2,000	107,100	173,700			4,800	288,000	13
Trinity		217,900	42,600				260,000	14
Tulare	59,100	50,000	66,900		5,600	500	182,000	21
Tuolumne		191,700	118,700				310,000	12
Ventura	54,800			1,800	10,200	800	68,000	39
Yolo	28,600				1,800	300	31,000	45
Yuba	900	37,500					38,000	44
Multi-County	156,200	5,200	203,400	8,100	15,400	4,100	392,000	
Total	2,127,000	4,957.000	3,036,000	464,000	2,546,000	557,000	13,687,000	

[1/] Quantities have not been reported for individual counties where there are less than three establishments in a particular category. These quantities have been included in the Multi-County figure. Multi-County also includes companies without a fixed location within the state or with a significant number of employees in more than one county.

A blank represents no waste generated or less than three establishments located in the county.

also associated with the disposal of food processing wastes.

TABLE III-8

TEN LARGEST INDUSTRIAL SOLID WASTE-PRODUCING COUNTIES
ANNUAL PRODUCTION - 1967

Rank	Total Industrial Wastes		Lumber Industry Wastes Excluded	
	County	Tons	County	Tons
1	Los Angeles	1,881,000	Los Angeles	1,817,000
2	Humboldt	1,802,000	San Bernardino	885,000
3	San Bernardino	920,000	Alameda	371,000
4	Mendocino	901,000	Santa Clara	343,000
5	Siskiyou	687,000	Contra Costa	253,000
6	Shasta	659,000	Orange	223,000
7	Alameda	388,000	Stanislaus	156,000
8	Del Norte	372,000	Fresno	149,000
9	Plumas	364,000	San Joaquin	148,000
10	Santa Clara	343,000	San Francisco	122,000

A difficulty in providing proper disposal for many of these wastes is their seasonal nature. For example, 68 percent of the cannery and frozen food wastes are produced during August, September, and October. At the present time no fully satisfactory means for disposing of this material have been developed.

The quantity of food processing wastes produced by each county in California is shown in Table III-7. As shown on Figure III-2, the largest food processing waste-producing counties are Los Angeles, Santa Clara, Stanislaus, Alameda, San Joaquin, and Fresno, with each county producing in excess of 100,000 tons per year. The seven additional counties indicated on the map each produce in excess of 50,000 tons per year. The subgroups listed in Table III-6 are discussed below:

(a) Fruit and Vegetable Fresh Pack Wastes

Wastes from fresh fruit and vegetable processing are estimated by the application of waste production factors to the numbers of employees in SIC Codes 0715, 0716, 5040, and 5041. It should be noted that these are special classifications used by the California Department of Employment and are not the same as those listed in the 1967 Standard Industrial Classification Manual.

The codes used by the State of California are as follows:

0715 - Contract sorting, grading, and packing of noncitrus fruits and vegetables for the growers.

0716 - Contract sorting, grading, and packing of citrus fruits for the growers.

5040 - Assemblers of noncitrus fruits and vegetables.

5041 - Assemblers of citrus fruits.

Since the employment under these classifications is very seasonal, factors were developed relating to tons of wastes per man month and applied to monthly employment data obtained from the California Department of Employment. The waste factor used was $1\frac{1}{2}$ tons per man month.

A total of 409,500 tons of fresh pack wastes were estimated to be produced in California during 1967. The five largest fresh pack waste-producing counties are Fresno, Tulare, Monterey, Ventura, and Riverside, with each county producing greater than 30,000 tons during 1967. Six additional counties produced greater than 10,000 tons during 1967.

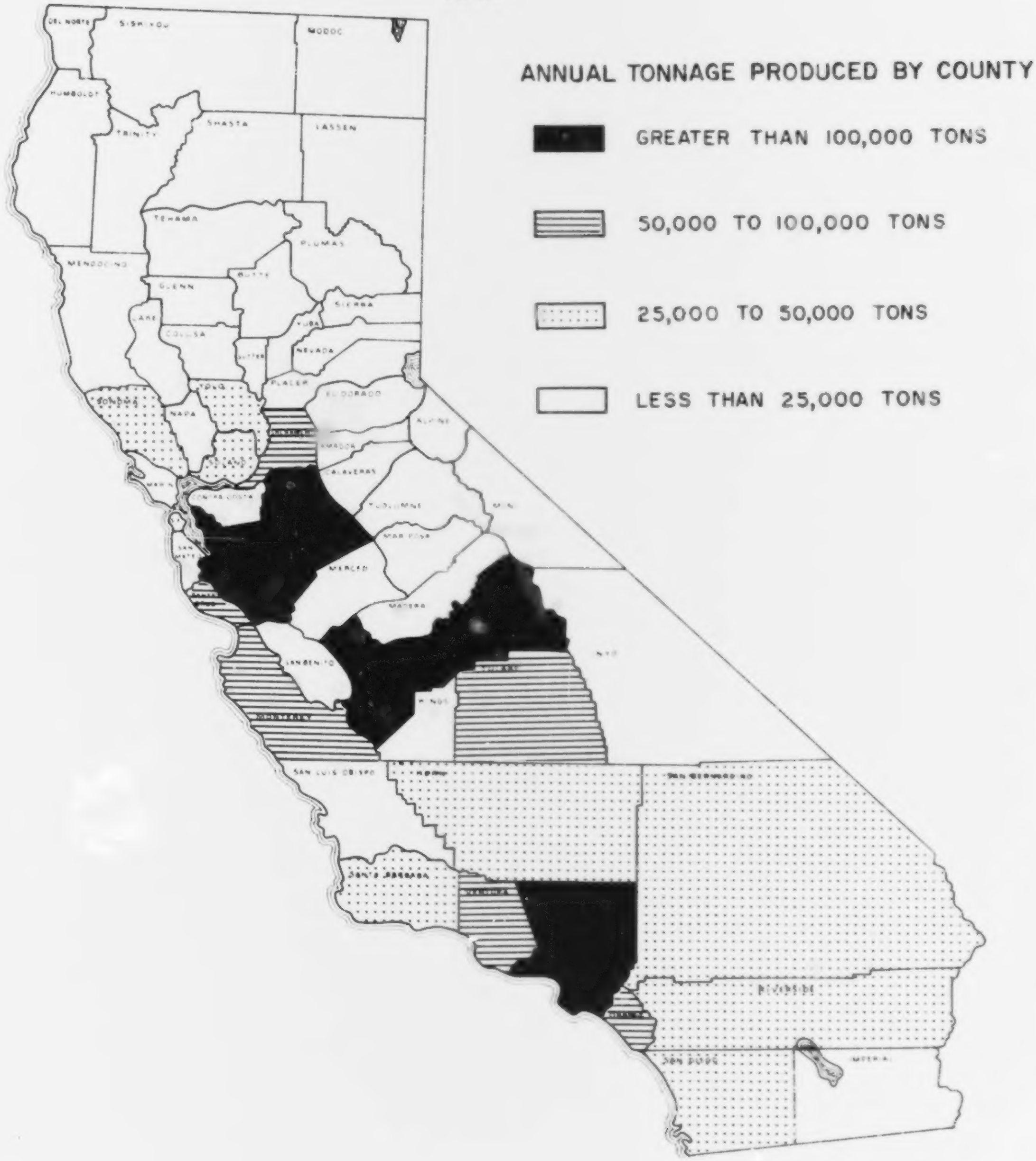
(b) Meat Products Processing Wastes

An estimated 100,000 tons of wastes were produced in California during 1967 from the processing of meat products. The largest quantity of meat

FIGURE III-2

DISTRIBUTION OF FOOD PROCESSING WASTES

-1967-


ANNUAL TONNAGE PRODUCED BY COUNTY
■ GREATER THAN 100,000 TONS
▤ 50,000 TO 100,000 TONS
⬚ 25,000 TO 50,000 TONS
☐ LESS THAN 25,000 TONS
DEL NORTE
SISKIYOU
MODOC
HUMBOLDT
TRINITY
SHASTA
LASSEN
TEHAMA
PLUMAS
MENDOCINO
GLENN
BUTTE
SIERRA
LAKE
COLUSA
YUBA
NEVADA
SUTTER
PLACER
SONOMA
NAPA
YOLO
EL DORADO
ALPINE
AMADOR
CALAVERAS
MARIN
CONTRA COSTA
TUOLUMNE
MONO
MARIPOSA
MERCED
MADERA
INYO
SAN BENITO
TULARE
KINGS
MONTEREY
SAN LUIS OBISPO
KERN
SAN BERNARDINO
SANTA BARBARA
VENTURA
RIVERSIDE
SAN DIEGO
IMPERIAL

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product waste is the paunch material from the approximately 3.2 million head of cattle slaughtered in California each year. The Los Angeles area accounts for nearly 50 percent of this waste and the San Francisco area for about 15 percent.4/ The usual method of disposal of the paunch material is by spreading on fields which often results in numerous fly and odor problems.

(c) Cannery Wastes and Frozen Food Wastes

At the request of this Department, the National Canners Association and the National Frozen Food Association each made statewide solid waste surveys of their respective industries. The National Canners Association reported 644,164 tons of cannery wastes from companies representing 85 percent of the industry. The statewide total for cannery waste production was estimated by the Department at 750,000 tons for 1967. The National Frozen Food Association reported a total of 133,429 tons of wastes from 73 percent of the industry. The total frozen food waste production has been estimated at 170,000 tons for 1967.

The major cannery and frozen food waste-producing counties are Santa Clara, Stanislaus, San Joaquin, and Alameda. These four counties produce greater than 50 percent of the total tonnage of these types of wastes. The 920,000 tons of cannery and frozen food wastes produced during 1967 were reportedly disposed of by the methods indicated in the following table.

4/ Logan, S. H. and G. A. King, Beef Cattle Feeding and Slaughtering in California, University of California Agricultural Experiment Station Bulletin 826, (Berkeley, 1966).

TABLE III-9

METHOD OF CANNERY AND FROZEN FOOD WASTES DISPOSAL - 1967

Method	Tons	Percent
Landfill Disposal Sites	285,000	31
Spread on Fields	110,500	12
Animal Food	276,000	30
Charcoal	46,000	5
Other*	101,250	11
Non-food Wastes**	101,250	11
Totals	920,000	100

*Other methods of disposal include ocean disposal.
**Non-food solid wastes consist of wood, paper, and metal materials.

(d) Other Preserved Foods and Miscellaneous Food Processing Wastes

The 197,500 tons of "other preserved foods" processing wastes and 500,000 tons of "miscellaneous food processing wastes" were estimated from the results of a statewide survey and the use of solid waste production factors applied to employee data. The Department's Bureau of Food and Drug Inspection, in cooperation with this study, recorded information on solid waste quantities, characteristics, and disposal at 113 food processing plants of various types throughout California during 1967. A special questionnaire was used for this survey so that the data could be gathered during routine scheduled inspections.

(2) Lumber Industry Wastes

Lumber is obtained from one of California's greatest natural resources, commercial forests. Commercial forests occur in 45 of California's 58 counties; however, more than half of the total acreage is located in six counties (Siskiyou, Humboldt, Trinity, Mendocino, Shasta, and Plumas). Approximately 17.3 million acres of land in California have been classified as commercial forest land.[5] The lumber industry focuses primarily on sawmill and planing mill operations (SIC Code 2421); however, in this report the logging camps and logging contractors (SIC Code 241) are also included as part of the industry.

Almost eight million tons of solid wastes were produced by the lumber industry in 1967. As shown in Figure III-3, the counties of Humboldt, Mendocino, Siskiyou, and Shasta each produced in excess of 600,000 tons of lumber wastes during 1967; 13 other counties produced in excess of 100,000 tons each during 1967. Lumber industry wastes are reported as sawmill and planing mill wastes and as logging debris in Tables III-6 and III-7. These two subgroups are discussed in the following two sections.

(a) Logging Debris

Logging debris is the single largest source of industrial solid wastes in California, with approximately five million tons produced per year. As shown in Table III-7, the five major timber-producing counties (Humboldt, Mendocino, Siskiyou, Shasta, and Del Norte) produce approximately 2.8 million tons (56.8 percent of the total) of logging debris annually. In Humboldt County alone, approximately 1.2 million tons were produced which is nearly 25 percent of the total.

Logging debris could be considered as a completely separate type of solid waste, falling somewhere between agricultural and industrial wastes. This debris consists of slash, cull logs, and brush. However, since the SIC manual classifies logging as an industry (SIC Code 241 - Logging Camps and Logging Contractors), logging debris is considered an industrial waste.

The quantity of logging debris produced in California was estimated by applying the waste factor of one ton of logging debris per 1,000 board feet of logs harvested to the latest available county data on timber cut (1966) obtained from the California Division of Forestry.[6] The factor was only applied to the timber cut for veneer logs and saw logs.

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[5] Zinuska, John A., et al, The Commercial Forest Resources and Forest Products Industries of California, University of California, Agricultural Experiment Station, (Berkeley, 1965).

The factor of one ton of debris per 1,000 board feet of merchantable timber volume was developed on the basis of information from three studies conducted by the Pacific Southwest Forest and Range Experimental Station, U.S. Forest Service.[7][8][9][10]

Presently, logging debris is left in the forest, stacked and burned, or chipped. Problems associated with just leaving this debris in the forest include fire hazards, timber reproduction losses, and the possibility of disease carry-over. Burning is not without problems since it usually cannot be conducted safely during the summer months because of fire danger, and winter conditions are often too wet. Another important factor is the public nuisance and air pollution which result from burning logging debris. Because of the problems associated with burning, the U.S. Forest Service conducted a feasibility study in the Stanislaus National Forest to determine if logging debris could be disposed of by burying.[9] It was reported that this method of slash disposal shows promise and has some distinct advantages over disposal by chipping or burning. The cost of burying these wastes was found to be many times

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[6] California Division of Forestry, State Forestry Note No. 35, January, 1968.

[7] Sundahl, William E., Slash and Litter Weight After Clear-Cut Logging in Two Young-Growth Timber Stands, U.S. Forest Service Research Note PSW-124, (Berkeley, 1966).

[8] Hall, Dale O. and Robert C. Neal, Reproduction Losses from Slash Disposal at the Challenge Experimental Forest, U.S. Forest Service Research Note PSW-N15, (Berkeley, 1963).

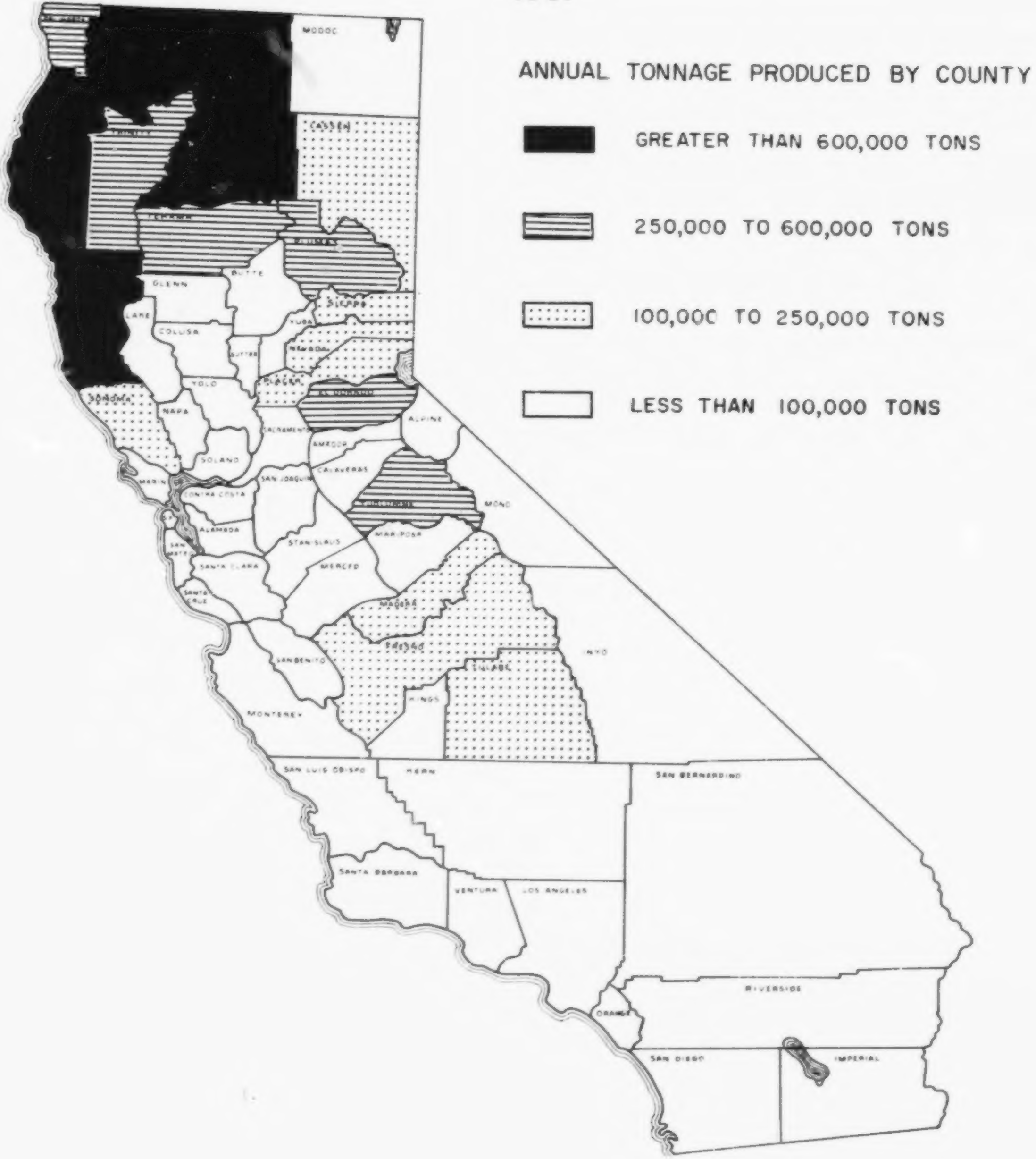
[9] Schmike, Harry E. and Ronald A. Dougherty, Disposal of Logging Slash, Thinnings, and Brush by Burying, U.S. Forest Service Research Note PSW-111, (Berkeley, 1966).

[10] Boe, Kenneth N., Sound Wood Residue Left After Experimental Cutting in Old-Growth Redwood, U.S. Forest Service Research Note PSW-136, (Berkeley, 1967).

FIGURE III-3

DISTRIBUTION OF LUMBER INDUSTRY WASTES

-1967-


ANNUAL TONNAGE PRODUCED BY COUNTY
GREATER THAN 600,000 TONS
250,000 TO 600,000 TONS
100,000 TO 250,000 TONS
LESS THAN 100,000 TONS
MODOC
LASSEN
TRINITY
TEHAMA
PLUMAS
GLENN
BUTTE
SIERRA
LAKE
COLUSA
YUBA
SUTTER
NEVADA
YOLO
PLACER
EL DORADO
SONOMA
NAPA
SACRAMENTO
ALPINE
SOLANO
AMADOR
MARIN
SAN JOAQUIN
CALAVERAS
CONTRA COSTA
TUOLUMNE
MONO
ALAMEDA
SAN MATEO
STANISLAUS
MARIPOSA
SANTA CLARA
MERCED
SANTA CRUZ
MADERA
FRESNO
INYO
SAN BENITO
TULARE
KINGS
MONTEREY
SAN LUIS OBISPO
KERN
SAN BERNARDINO
SANTA BARBARA
VENTURA
LOS ANGELES
RIVERSIDE
ORANGE
SAN DIEGO
IMPERIAL

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higher than the method of piling and burning, but slightly less than chipping. Considering the great emphasis now being placed on basin-wide air pollution control, the burying of logging debris appears to be a good alternative to burning.

(b) Sawmill and Planing Mill Wastes

The second largest type of industrial solid wastes was the 3,036,000 tons of sawmill and planing mill wastes produced during 1967. (This subgroup includes only the wastes from SIC Code 2421, Sawmills and Planing Mills.) The five largest sawmill waste-producing counties are Humboldt, Mendocino, Shasta, Siskiyou and Tehama. These five counties produced approximately 1.6 million tons, slightly more than 50 percent of the total during 1967.

The total quantity of sawmill and planing mill residue (bark, chips, sawdust, etc.) was estimated by applying a factor to the latest available data on timber cut for veneer logs and saw logs. The factor of 1.225 tons of residue per 1,000 board feet log scale was developed by the Forest Products Laboratory, University of California, Agriculture Extension Service.[11] The total quantity of wood residue was then divided among the counties in proportion to the employment under SIC Code 2421 and adjusted according to the amount of utilization of this material. For example, in Shasta County 55 percent of the wood residue is utilized for by-products.[12] Humboldt and Shasta counties utilize a greater portion of the wood residue than the rest of the state because of export and pulp mill operations. The quantity of sawmill and planing mill wastes for each county is reported in Table III-7.

At the present time most of the wood wastes are burned in "teepee" type incinerators. These burners usually produce vast quantities of smoke which can often be seen for miles.

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[11] Forest Products Research Society, Proceedings of Northern California Section, April 20-21, (Fresno, California, 1967).

[12] William A. Dost, Report to the Shasta County Forest Products Council, Forest Products Laboratory, University of California, 1966.

A report by the Forest Products Laboratory presented detailed information on the production, uses and disposal of wood-processing residues in Shasta County, California, during 1966.[13] The following data adapted from that report are presented to illustrate the types and quantities of wood residues produced by the sawmill and planing mill industries.

Sawmill Residues
Shasta County - 1966

		Total Tonnage	Tons Utilized	Tons Wasted
Bark	Log yard	25,807	0	25,807
	Mill deck	108,544	37,012	71,532
Fine Wood	Dust	100,922	57,406	43,516
	Shavings	68,445	44,504	23,941
Coarse Wood	Chippable	236,722	175,109	61,613
	Dry trim and other losses	81,897	27,082	54,815
Totals		622,337	341,113 (55%)	281,234 (45%)

The following quotation from the above report summarizes the problem and presents possible solutions:

> "Problems associated with the residues from wood processing operations have become increasingly acute in recent years. On one hand, operators are faced with the necessity of increasing the percentage of raw material converted to products in order to maintain a competitive position. On the other, they are faced with increasing pressure from the community to reduce or eliminate the smoke and ash problems caused by common residue disposal methods.
>
> "The industry generally, and in Shasta County, have responded to both of these pressures. Examples of the first type can be seen locally in the production of pulp chips and particle board from waste wood and soil amendments from bark. Examples of the

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[13] See footnote No. 12, page III-31

second type are the recent cooperative study of burner modification conducted by the State Department of Public Health and the extensive and expensive modifications of residue collection and disposal systems by U.S. Plywood-Champion papers.

> "The magnitude of the problem remaining should not be underestimated. Only slightly more than half of the residues generated in the county (Shasta County, California) is presently being put to economic use. From a qualitative standpoint, the problem is even more difficult in that much of the material useable under the technology and economics of today is already being recovered."

(3) Chemical and Petroleum Industry Wastes

During 1967, as reported in Table III-6, an estimated 126,800 tons of chemical waste and 336,800 tons of petroleum refining waste were produced in California. In this report, chemical waste refers to the waste produced by industries within SIC Major Group 28, Chemicals and Allied Products. Petroleum waste refers to waste produced by industries within SIC Major Group 29, Petroleum Refining and Related Industries (oil field wastes are not included in this group). These two groups are combined for discussion purposes because of the similar characteristics of their wastes. The environmental effects and hazards to the public from these wastes are discussed in Chapter VII, ENVIRONMENTAL EFFECTS OF SOLID WASTES.

As shown in Table III-7 and Figure III-4, the major portion of these wastes (an estimated 382,400 tons, 82.5 percent) is produced in Los Angeles and Contra Costa counties. These counties each produce in excess of ten times as much chemical and petroleum wastes as the third highest producer. Data on the estimated quantities and the development of waste production factors for chemical and petroleum industry wastes are presented in the next two sections under their respective headings.

(a) Chemical Wastes

With the cooperation and assistance of the Chemical Industrial Council of Northern California, a survey was made of chemical solid waste production and disposal in the San Francisco Bay Area. An industrial waste survey form developed by the Department was mailed by the council to their membership. The returned forms from eight firms in Contra Costa County (representing over 25 percent of the total statewide employment in SIC Code 281, Industrial Inorganic and Organic Chemicals) were used in developing the waste factor of 10 tons per employee per year for SIC Code 281. It was considered that these relatively large basic chemical companies would have a larger waste factor than the more specialized firms. These eight firms employ approximately 2,350 persons and during 1967 produced approximately 24,000 tons of solid and semi-solid wastes. Five of these firms disposed of at least a portion of their wastes (a total of 5,500 tons) on their own premises. The remaining 18,500 tons of wastes were picked up by private collectors or industrial waste haulers and hauled to other sites for disposal.

The waste production factor of 2.25 tons per employee per year was used for paint manufacturing firms (SIC Code 285) and the factor of 0.5 ton per employee for the remaining firms in SIC Code 28.

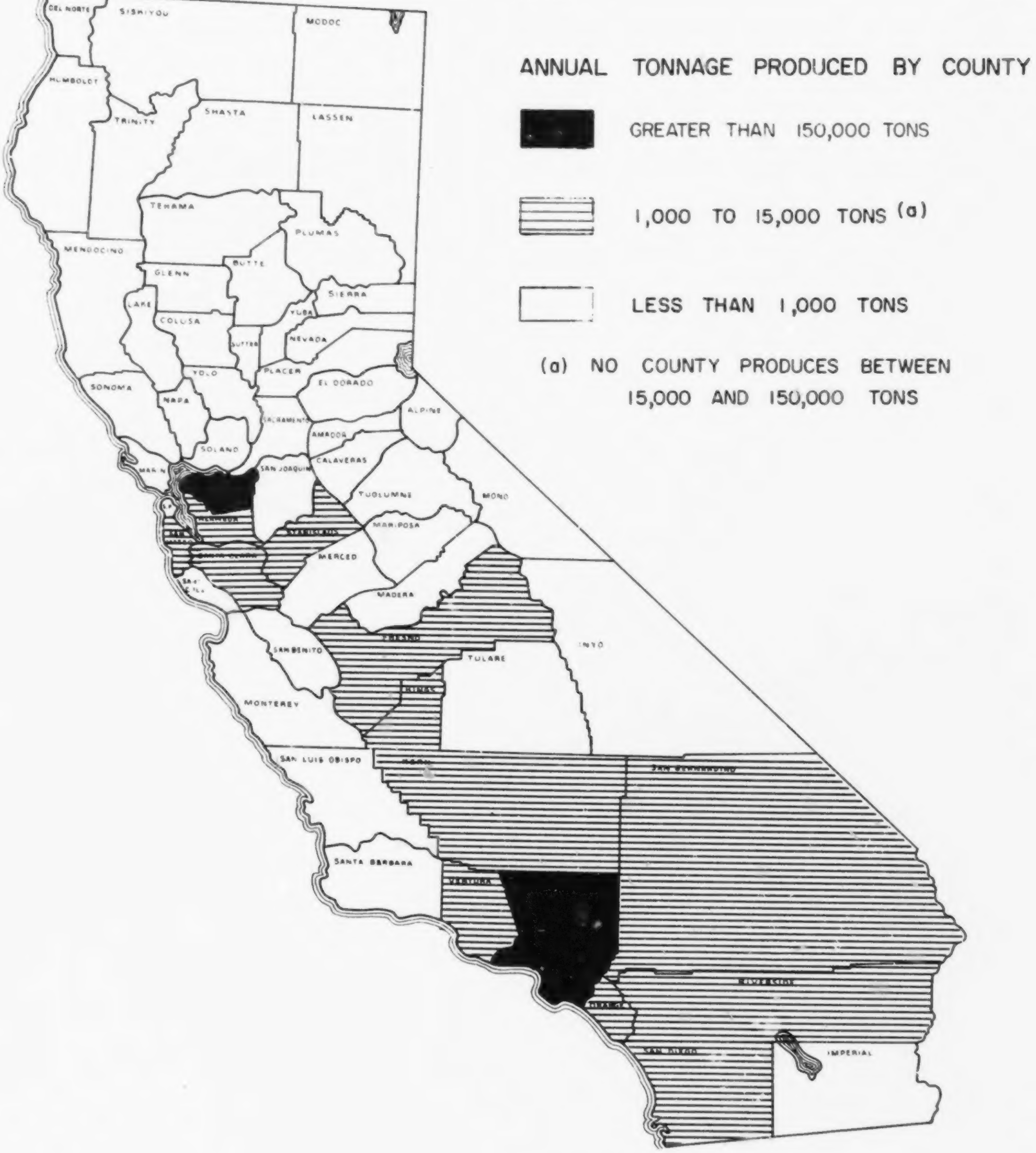
(b) Petroleum Wastes

A survey of the four major petroleum refineries in Contra Costa County was conducted jointly by the Western Oil and Gas Association (WOGA) and the Department. A survey form was completed by each firm and the data tabulated by WOGA. The 115,655 tons produced by these refineries represent 95 percent of the petroleum refining wastes produced in Contra Costa County and 37 percent of that produced in the state. Based on this data, a waste production factor of 23.5 tons per employee per year was developed for SIC Code 2911, Petroleum Refining. Inasmuch as petroleum refining related industries are similar to the chemical industry, a similar factor of 10 tons per employee per year was applied to these employment data. Statewide, approximately 91 percent of the wastes reported in Table III-6 as petroleum refinery and related industries is actually refinery waste and the remaining 9 percent is from the related industries.

FIGURE III-4

DISTRIBUTION OF CHEMICAL AND PETROLEUM INDUSTRY WASTES

– 1967 –


ANNUAL TONNAGE PRODUCED BY COUNTY
■ GREATER THAN 150,000 TONS
▤ 1,000 TO 15,000 TONS (a)
☐ LESS THAN 1,000 TONS
(a) NO COUNTY PRODUCES BETWEEN 15,000 AND 150,000 TONS
DEL NORTE
SISKIYOU
MODOC
HUMBOLDT
TRINITY
SHASTA
LASSEN
TEHAMA
PLUMAS
MENDOCINO
GLENN
BUTTE
SIERRA
LAKE
COLUSA
YUBA
SUTTER
NEVADA
YOLO
PLACER
SONOMA
NAPA
EL DORADO
SACRAMENTO
ALPINE
AMADOR
SOLANO
MARIN
SAN JOAQUIN
CALAVERAS
TUOLUMNE
MONO
ALAMEDA
STANISLAUS
MARIPOSA
SANTA CLARA
MERCED
MADERA
FRESNO
INYO
SAN BENITO
TULARE
KINGS
MONTEREY
SAN LUIS OBISPO
KERN
SAN BERNARDINO
SANTA BARBARA
VENTURA
RIVERSIDE
ORANGE
SAN DIEGO
IMPERIAL

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(4) Manufacturing Wastes

During 1967 an estimated 3,103,000 tons of manufacturing wastes were produced in California. These manufacturing wastes have been divided into two subgroups: Heavy Manufacturing (2,546,000 tons) and Light Manufacturing (557,000 tons).

The quantity of each subgroup of manufacturing wastes is presented in Tables III-6 and III-7. The major manufacturing waste-producing counties are shown in Figure III-5 and below in Table III-10. In this table the 15 largest manufacturing waste-producing counties are presented in the order of their magnitude of manufacturing waste production.

TABLE III-10

MAJOR MANUFACTURING WASTE-PRODUCING COUNTIES - 1967

County	SIC Code[14/]	Quantity Tons Per Year
(1) Los Angeles	33,36,35,37	1,246,000
(2) San Bernardino	33	839,200
(3) Alameda	33,32,35,37	208,800
(4) Orange	36,35,37	132,900
(5) Santa Clara	36,35,37	105,600
(6) Contra Costa	33,34	82,200
(7) San Diego	36,33,35,19	67,800
(8) San Francisco	37,33,34,36,35	58,900
(9) San Mateo	33,35,36	49,900
(10) Riverside	33,37,24,35,36	37,600
(11) Humboldt	24	31,300
(12) San Joaquin	24,35	25,300
(13) Siskiyou	24	24,500
(14) Fresno	35,24,32	20,600
(15) Sacramento	24,37,35,34	17,900

14/ This column shows the type of manufacturing waste by SIC Code. The SIC Codes are presented with those representing the largest quantity of waste first. Any SIC Code which represents at least 10 percent of a county's total manufacturing waste is shown. See Appendix A for identification of code numbers.

The quantities of manufacturing solid wastes presented in this report were primarily estimated by the application of waste production factors to employment data. These factors were based on a limited number of interviews, mail surveys, and analysis of published reports.15/16/17/

The following example is presented using the industries manufacturing transportation equipment (SIC Code 37, in the Heavy Manufacturing subgroup) to illustrate the procedure used to estimate the production of manufacturing solid wastes.

TABLE III-11

SOLID WASTE PRODUCTION DATA FROM MANUFACTURE OF TRANSPORTATION EQUIPMENT

Number of Employees	Number of Reporting Units	Annual Waste Production Factor	Annual Total Tonnage
1-19	680	50 tons/unit	34,000
20-49	244	100 tons/unit	24,400
50-99	125	250 tons/unit	31,300
100-499	122	600 tons/unit	73,200
> 500	54	3,000 tons/unit	162,000
Total			324,900

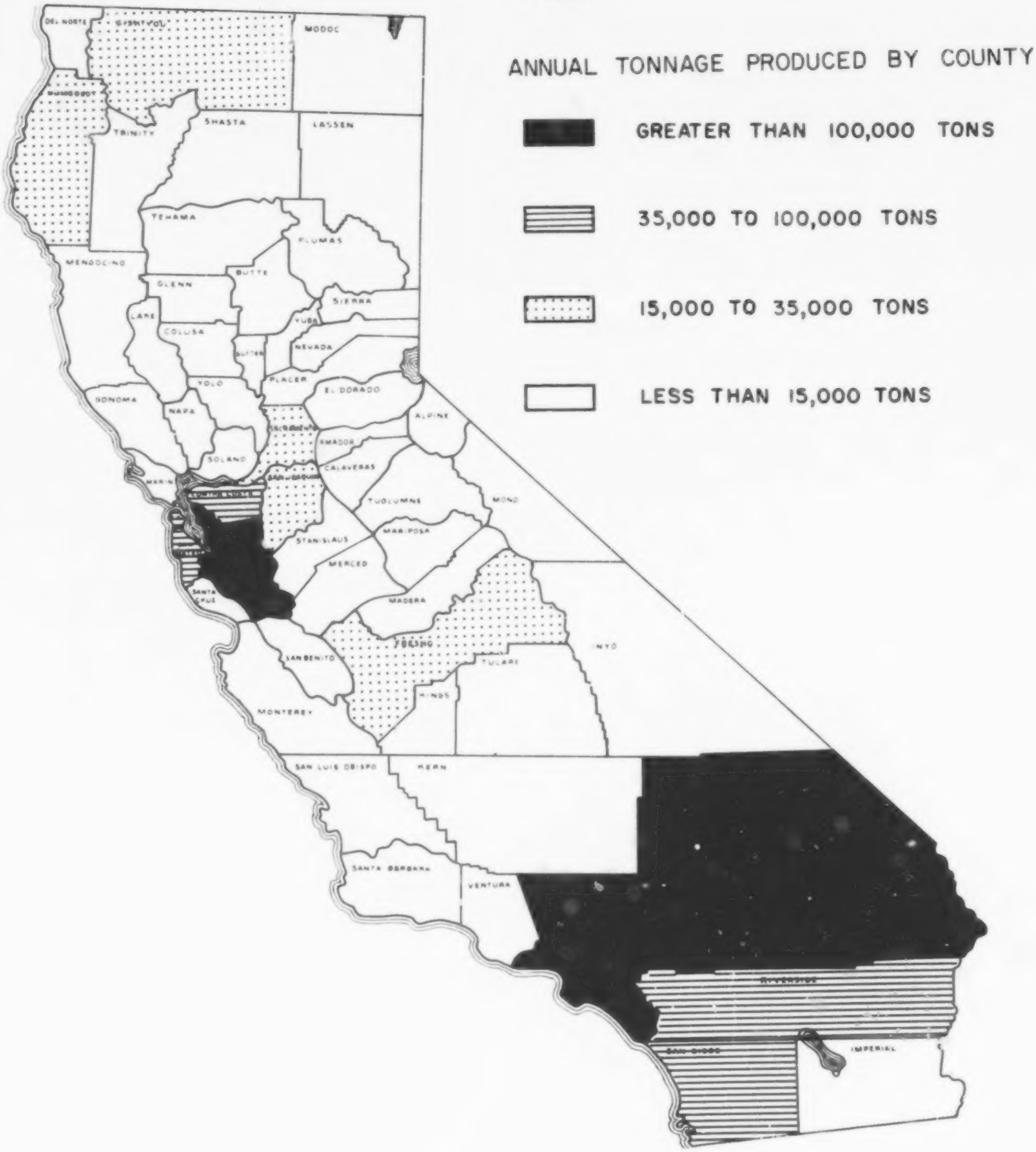
15/ Aerojet-General Corporation, Fresno Region Solid Waste Management Study - Vol. III - Appendices, (a report to the California Department of Public Health, June 1967).

16/ FMC, Machinery/Systems Group, FMC Corporation, Solid Waste Disposal Systems Analysis, (prepared for the City of San Jose and the County of Santa Clara, 1968).

17/ Combustion Engineering, Inc., Technical-Economic Study of Solid Waste Disposal Needs and Practices - Industrial Inventory, Vol. 2, (preliminary report for the U.S. Public Health Service, 1967).

FIGURE III-5

DISTRIBUTION OF MANUFACTURING WASTES
-1967-


ANNUAL TONNAGE PRODUCED BY COUNTY
■ GREATER THAN 100,000 TONS
▤ 35,000 TO 100,000 TONS
▨ 15,000 TO 35,000 TONS
☐ LESS THAN 15,000 TONS
DEL NORTE
SISKIYOU
MODOC
HUMBOLDT
TRINITY
SHASTA
LASSEN
TEHAMA
PLUMAS
MENDOCINO
GLENN
BUTTE
SIERRA
LAKE
COLUSA
YUBA
SUTTER
NEVADA
PLACER
YOLO
SONOMA
NAPA
EL DORADO
ALPINE
SOLANO
AMADOR
CALAVERAS
MARIN
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STANISLAUS
MARIPOSA
MERCED
SANTA CRUZ
MADERA
FRESNO
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The solid waste production factors for this industry are related to the size (number of employees) of the firm. As of March 12, 1967, 247,726 persons were employed by the 1,225 companies manufacturing transportation equipment in California.[18] Table III-11 is the tabulation of the solid wastes produced by the various employment-size ranges of firms. The data in this table are for the industry state-wide. To determine the production of solid wastes from the industries manufacturing transportation equipment on a county basis, the same procedure was applied to the firms located in each county.

Industrial solid waste production data for each of the 17 standard industrial classifications shown under Manufacturing in Table III-6 was calculated using the above procedure. In those cases where actual solid waste production data have been obtained, it was used.

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[18] See footnote 2, page III-18

IV. ADMINISTRATION AND CONTROL

The development of adequate laws and regulations is a major factor in the success of an overall solid waste management program. Such regulations provide basic working requirements for all who are involved and reflect the minimum conditions a community (city, county or state) will accept. Without such regulations a community suffers from the lack of delineation of responsibilities, not only to the private entrepreneurs but to the public agencies that must serve the people within their jurisdictions.

Laws and regulations regarding solid wastes at all levels of government are incomplete and outmoded. The federal government has only recently initiated a solid waste program. This is primarily in the form of financial support to aid in research, planning, domonstration, and training programs. State agencies have developed laws in the specific fields which the individual agencies are involved. These laws are far from being all-encompassing and reflect only the programs and the specific interests of these agencies. Local government controls solid waste management to a greater extent than the other levels of government. However, this involvement often stems from emergency or complaint motivations. In other words, as complaints arise, regulations are developed to abate the isolated problem. A description of the various agencies and the

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existing laws and regulations follows. The fragmented approach and lack of overall authority in administration and control of solid waste management will become evident to the reader.

A. INVOLVEMENT OF FEDERAL AGENCIES

1. FEDERAL LAWS

Until the passage of the Solid Waste Act of 1965 (P.L. 89-272), the federal government had little involvement with solid wastes in the nation. This legislation authorized 92.5 million dollars:

> (1) "To initiate and accelerate a national research and development program for new and improved methods of proper and economic solid waste disposal, including studies directed toward the conservation of natural resources by reducing the amount of wastes and unsalvagable materials and by recovery and utilization of potential resources in solid wastes, and,
>
> (2) "To provide technical and financial assistance to state and local governments and interstate agencies in the planning, development, and conduct of solid waste programs."

The Act established the Solid Waste Program within the Public Health Service, Department of Health, Education, and Welfare and within the Bureau of Mines, Department of the Interior.

There are two additional federal laws that deal with specialized effects of solid wastes. The Rivers and Harbors Act of 1899 relates to the obstruction of navigable waters; and the Federal Plant Pest Regulations relate to the dissemination of plant pests. A brief discussion of these two laws follows.

Section 13 of the Rivers and Harbors Act of 1899 makes it unlawful to deposit, throw, etc., onto the bank or into any navigable water or tributary of any navigable water in the United States, any "refuse matter" of any kind or description. This act provides, however, that a permit may be granted by the Secretary of War for such deposit of these materials subject to strict requirements enforced by the Corps of Engineers.

Federal Plant Pest Regulations (subpart, Garbage 330.400) provide for inspection of all ships and planes arriving in the United States from any place outside thereof, and keeping under surveillance all movements and disposal of "garbage" from these vessels so as to prevent the dissemination of plant pests.

In addition to the two preceding laws, Executive Order 11282 dated May 26, 1966 regulates burning on "Federal Installations". This is not a law and affects federal installations, such as military bases, only. The order states:

> "In urban areas refuse shall not be burned in open fires and in rural areas it shall be disposed of in such a manner as to reasonably minimize pollution. Refuse shall not be left in dumps without being covered with inert matter within a reasonably short time. Whenever incinerators are used, they shall be of such design as will minimize emission of pollutant dusts, fumes, or gases."

2. FEDERAL AGENCIES

U.S. Public Health Service (Department of Health, Education, and Welfare) is the federal agency primarily involved with solid waste management through its Solid Waste Program. This office administers federal research, training, statewide planning, and demonstration grant funds; coordinates research efforts throughout the country; conducts research directly and through contracts; conducts training courses in solid waste management; and provides technical assistance and consultation to states and other agencies. The Public Health Service is also developing recommended guidelines on various aspects of solid waste management. They also review and make recommendations regarding applications to the Bureau of Land Management for surplus land to be used for refuse disposal.

U.S. Bureau of Mines (Department of Interior) is involved in the development of technically and economically attractive metallurgical or chemical processes for utilization of solid wastes resulting from extracting, processing, or using minerals or fossil fuels. This involves automobile scrap; mine, mill and smelter residues; nonferrous scrap; and fly ash.

U.S. Forest Service (Department of Agriculture) regulates and provides for the collection and disposal of refuse from recreational areas and regulates timber wastes in the management of national forests. This agency administers the use of U.S.F.S. lands, some of which may be delegated for public use as disposal sites through the issuance of a use permit.

U.S. Army Corps of Engineers (Department of Defense) removes and disposes of floating debris and other solid wastes from navigable waters. This agency issues permits on any "work" in navigable waters or flood control projects and enforces the Rivers and Harbors Act of 1899.

U.S. Bureau of Land Management (Department of Interior) may lease or sell surplus federal land to public agencies for use as refuse disposal sites. This agency also establishes regulations, controls, and policies for the use of these lands.

B. INVOLVEMENT OF STATE AGENCIES

1. STATE LAWS

The existing laws are extremely fragmented, incomplete, and inconsistent. For example, "garbage" and "refuse" are defined in various codes at least six different ways. A uniform understanding is lacking in these laws because most statutes have been directed towards a specific, narrow viewpoint and developed without consideration of overall needs. The existing code sections are aimed at protecting water, air, and wildlife; preventing forest fires;

and maintaining highways free of litter. Even the health of hogs is protected from the disease hazards of garbage. Conspicuous by their absence, however, are laws designed specifically to protect people, their health, and well-being from degradation by solid wastes. Perhaps the most notable deficiency found in a review of existing state statutes is the fact that no state agency has the overall responsibility for regulating solid waste management. Without such guidance, each agency seeks laws to control their own specific interest without regard for overall needs.

Following are summaries of the various state codes which regulate some form of solid waste. More detailed descriptions of these codes are included as Appendix B.

The Health and Safety Code and Title 17 of the Administrative Code include only a few public health aspects of solid wastes. There are provisions for preventing dumping in public places and navigable waters; the storage conditions and removal of "garbage" from hotels, restaurants, and mobile home parks; the handling and disposal of hospital and radioactive wastes; and the formation of districts for the collection and disposal of refuse.

The Fish and Game Code makes it unlawful for individuals to deposit or dump any refuse or solid material in the waters of the state.

The Public Resources Code requires all "rubbish dumps" located in unincorporated areas of the state to have a permit issued by the State Forester. This section also sets forth requirements for fire protection.

Highway litter, "rubbish vehicles", abandoned cars, and junk yards are topics briefly considered in the Vehicle Code, and Streets and Highways Code. The Penal Code prohibits roadside littering and dumping in the waters of the state and establishes and defines the general condition of a "public nuisance" in a community.

The Government Code permits each county to contract for collection of "garbage" and levy taxes for same. It also allows, but does not require, a county to include in its general plan an element for "public service" such as refuse disposal.

There are also provisions in various codes which allow some responsibility in solid waste management by 13 of the 50 types of special districts of the state. Few, however, actually participate. These districts are discussed in greater detail later in this chapter.

2. STATE AGENCIES

A number of state agencies are currently involved either directly or indirectly in solid waste management. The agencies concerned with solid wastes are listed below with their related function.

State Department of Public Health is the primary state agency involved in solid waste management. Because of the public health nature of solid wastes, the State Department of Public Health, through its Division of Environmental Health, has conducted a minimal solid waste program for a number of years. These activities have been conducted as a part of a general vector control program within the Bureau of Vector Control and Solid Waste Management[1]. This Bureau has a general responsibility for protection of the public health from vector-borne diseases and nuisances. This work has covered many aspects of solid wastes consisting primarily of solid waste and vector control surveys and studies. These studies included such elements as fly control, rodent control, water quality control, air pollution, and other specific public health problems.

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[1] The name of this Bureau (originally the Bureau of Vector Control) was changed in August 1968.

With the grant funds provided for the three-year California Solid Waste Planning Study, the Department was able to expand the Solid Waste Engineering Section. While the primary function of this section is to conduct the Statewide Solid Waste Planning Study, the staff has been able to provide a limited amount of consultation assistance to public and private agencies. Unfortunately, the number of requests for this service greatly exceeds the resources available for this function.

Department of Agriculture regulates the disposal of refuse from international vessels and aircraft. No garbage can be collected or transported from international carriers unless the collector holds a valid permit issued by the Department of Agriculture. Facilities used for the disposal of the garbage must also be approved by the Department. The Department of Agriculture also regulates the feeding of garbage to hogs. Licenses to feed garbage to swine are issued and inspections of garbage feeding premises are made.

Division of Forestry is directly involved with solid waste disposal through that agency's rubbish dump permit program. Any disposal site in the unincorporated portion of the state must obtain a permit from the Division of Forestry. These permits serve to alert the operator of the disposal site to the control of fires and provide fire protection agencies with a method of establishing reasonable fire prevention measures for each specific disposal site. These measures are limited only to matters of fire prevention such as cleared areas for firebreaks, removal of flammable material, and time or season burning is permitted.

State Air Resources Board develops statewide policy for control or prevention of air pollution including that from burning of solid waste materials.

State Water Resources Control Board develops statewide policy to protect the quality of waters of the state. This board has financially-supported research related to pollution of ground waters by solid waste disposal.

Regional Water Quality Control Boards are responsible for defining reasonable and beneficial use of the waters of the state, and the regulation of waste discharges to protect water quality and those beneficial uses. These regulatory agencies regard solid waste disposal sites to be a form of waste discharge which may affect water quality. No uniform statewide policy or regulations exist relative to water quality control and solid wastes, with several of the regional boards not routinely regulating solid waste disposal. Several of the regional boards in Southern California have adopted a disposal site classification system to facilitate the consideration of solid waste disposal sites. This system controls the type of solid waste acceptable at each disposal site based upon the potential pollution of underlying ground water as controlled by the geology and hydrology of the site. Specific waste discharge requirements adopted by the boards may include maintaining a minimum distance between ground water and the bottom of the disposal site fill, controlling surface drainage and prevention of water-caused nuisance conditions.

Division of Highways conducts roadside litter control programs and collects refuse from state highways.

Department of Motor Vehicles establishes requirements for the legal disposal of abandoned or wrecked vehicles and the control of litter from refuse collection vehicles.

San Francisco Bay Conservation and Development Commission regulates the filling of San Francisco Bay, including projects utilizing solid wastes.

Department of Water Resources provides technical service to state and regional water quality control boards regarding water quality aspects of solid waste disposal. They also conduct studies under contract of solid waste disposal as it affects water quality, for example the landfill-water quality studies in Southern California conducted under the Porter-Dolwig Ground Water Basin Protection Law.

Department of Fish and Game has the authority to control the disposal of solid wastes relative to surface water as it relates to the protection of fish and wildlife.

University and State Colleges provide basic research on various aspects of solid wastes. The Agricultural Extension Service provides advice, consultation, and performs research on management of agricultural wastes.

C. INVOLVEMENT OF LOCAL JURISDICTIONS

Currently, all of the solid waste planning, operational functions, and most of the regulatory controls are transacted at the local level. Cities collect and dispose of their own solid wastes or contract with private agencies. Most of the regulations regarding solid waste collection are developed at the city level. In addition to regulations, counties are often involved in planning and operating refuse disposal sites and issuing franchises for collection in unincorporated areas. Forty-two of the 58 counties have developed solid waste ordinances. Expanded discussion of these ordinances will be presented in the collection and disposal chapters.

The local departments involved in solid waste management are health, planning, public works or roads, or some other special governmental unit. The county board of supervisors and the city council, however, are the major policy-setting body for their jurisdiction's activities in the area of solid waste management.

The "special district" is another type of agency that may become involved with solid wastes at the local level. As defined by the State Controller's office, there are 3,676 "special districts" (exclusive of school districts) in California of which 1,162 are empowered to regulate, collect, or dispose of refuse. The district's powers and range of activities vary from complete control to establishment of requirements for operation. At the present time there are 13 types of special districts involved in solid wastes.

There is one type of district in the state, "Garbage Disposal District", that may be formed exclusively to provide for the collection and disposal of "garbage" or other "refuse matter" of the district. A second type, "Garbage and Refuse Disposal District", exists in the state for the maintenance and operation of "garbage disposal sites" (since October 1, 1961, they may no longer be formed).

There are 11 other types of districts in the state that may involve themselves with solid wastes in one way or another. All of these districts have been originally formed for other primary functions, adding solid waste handling to their activities at a later date. Even though there are approximately 1,162 of these districts (as of June 30, 1967), only a handful actually have a solid waste program.

The following is a list of the 13 special districts and a description of their activities involving solid waste. The number in parentheses following the name of the district indicates the total number of districts of that type as of June 30, 1967. Each district's enabling legislation is also listed following the name of the district.

Air Pollution Control District (9) Health and Safety Code Sec. 24198-24399

May adopt regulations to prevent open burning of solid wastes from any source. Empowered to set requirements for incinerator stack emissions.

Community Services District (155) Government Code Sec. 61000-61936

May be formed in the unincorporated territory in one or more counties to provide "garbage service".

Park and Recreation District (111*) Public Resources Code Sec. 5780-5788

May provide "garbage collection" or disposal services in district where such service is not provided by any other public agency.

County Sanitation District (136) Health and Safety Code Sec. 4700-4859

May construct, maintain, and operate within the district boundaries a system for transfer and/or disposal of refuse, provided, however, that such system shall not include "refuse collection".

County Service Area (332) Government Code Sec. 25210-25210.8

May provide any service that a county is not prohibited from doing.

County Water District (207) Water Code Sec. 30000-33240

May acquire, construct, and operate facilities for, or may contract with others for, the collection and disposal of the "garbage waste" and "trash" of the district and its inhabitants.

Garbage Disposal District ([illegible]) Health and Safety Code Sec. 4100-4165.7

May provide for the collection and disposal of "garbage" or other "refuse matter" of the district.

Garbage and Refuse Disposal District (2) Health and Safety Code Sec. 4170-4197

May provide for the maintenance and operation of a "garbage disposal site". (As of 1961, this type of district may no longer be formed.)

Local Health District (1) Health and Safety Code Sec. 850-972

May acquire, construct, maintain, and operate all facilities and equipment necessary for the disposal of "garbage and wastes". (As of 1959, they may no longer be formed.)

Municipal Utility Districts (5) Public Utilities Code Sec. 11501-14509

May acquire, construct, operate, etc., within or without the district, facilities for supplying a means for the collection, treatment, or disposition of "garbage and refuse matter".

Public Utility District (66) Public Utilities Code Sec. 15501-18055

Activities similar to those of a Municipal Utility District.

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* Includes Resort Improvement District

Resort Improvement District (*) Public Resources Code Sec. 13000-13230

May acquire, construct, maintain, operate facilities for the collection or disposal of "garbage and refuse matter".

Sanitary District (128) Health and Safety Code Sec. 6400-6941.9

May acquire, etc., "garbage dump site" and "garbage collection and disposal systems".

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* Included in Park and Recreation District

V. SOLID WASTE COLLECTION

Collection is the most expensive activity in a solid waste system. It is this portion of the solid waste handling cycle that most directly affects the citizenry.

Almost all solid waste materials must be removed for disposal on a frequent and regular schedule. Solid waste collection systems were originally established out of necessity to remove the problem wastes, these being most commonly the putrescible organic materials comprising garbage. Today sociological changes and respect for a decent environment dictate the necessity for removal of a higher percentage of all the solid wastes produced. Solid waste handling practices must now transcend the original concept of merely protecting the health of the people from materials that breed flies, rats and other vectors of disease. These practices, in addition to combining vigilance against spread of disease and good housekeeping practices, must protect the total environment. This protection may be evident in many ways. For example, the collection practices should not burden society by being incomplete and,therefore, leaving the home owner with a volume of uncollected wastes for which he must find another means or place of disposal. Other environmental factors exist including offenses to man's senses, such as the collection system being too noisy.

It has been well-established that a suitable method that will minimize public health hazards is the removal of all refuse from each residence at least two times a week. Adequate containers, clean storage areas, and good disposal facilities also play important roles.

In California every city and county is empowered to provide collection service to their citizens; in addition, many special districts have this power. Government may provide the service directly or may contract with private firms,or both may operate in the same city. It is estimated that there are a total of about 900 refuse collection agencies operating in California.

Even with these provisions and the acknowledged necessity for collection, there are over 2.2 million people in the state who do not have collection service.

In the area of agricultural wastes, no systematic means of collection have yet been developed. In spite of the many problems associated with agricultural wastes, the means of managing, collecting, and disposing of these wastes are currently left to the discretion of the individual producer. Manure is occasionally collected from the source and transported beyond the property of the owner when the source is too close to population centers or when there is a customer for the product as fertilizer. Orchard prunings, vines, crop residues, and other types of agriculture wastes are usually burned or returned to the soil at the source. Food processing wastes are sometimes collected and transported back to the fields for use as green fertilizer or animal feed.

A. REGULATION OF COLLECTION PRACTICES

Controls placed on the collection agencies in California vary from quite stringent to virtually uncontrolled. In some jurisdictions, the private collector must have a franchise, annual vehicle permit, and approval of disposal facilities. In other areas the collector only needs a business license, if that, and is free to collect and transport wastes wherever he so desires. This latter condition is most prevalent in the rural areas of the state.

Local regulations vary but basically appear in local ordinances as four basic components. These are as follows:

(1) Frequency of Collection Service - minimum interval for collection of residential, commercial, industrial, etc., refuse, usually once a week for residential wastes and more frequent for commercial and industrial wastes.

(2) Mandatory Collection Service - the requirement that all establishments be served with collection and that all residents use the service. Some counties apply mandatory collection provisions to a population density factor, e.g., number of residents per acre or dwellings per square mile.

(3) Billing - includes service rates and who is liable for payment of service; also considers the billing agency and method of billing.

(4) Containers - specific size, volume, weight, material's physical characteristics, and cleanliness of containers.

Additional items such as definitions, storage and collection practices, enforcement, and special handling such as burning and importation of refuse are considered in a few ordinances.

The following sections present a discussion of collection practices as they occur in incorporated cities, unincorporated areas, and special districts in California. Inasmuch as these types of jurisdictions and their collection practices are quite dissimilar, they are discussed separately.

B. COLLECTION PRACTICES IN CITIES

Every city (399) in California has some collection service available to its residents. This collection has become a necessity rather than an optional service because of the dense population and urban growth most cities in the state have been experiencing. Due to the more and more distant disposal sites and the increasing closeness of the next door neighbor, the residents are finding it necessary to remove the refuse by a collection system that requires little involvement of the property owner.

1. EXTENT OF SERVICE

With the exception of residential garbage and rubbish, many collection systems do not make provisions for the pickup of all types of solid wastes. Wastes which are not collected become the responsibility of the producers to dispose of individually. The following table shows the distribution of collection by the number of cities collecting each particular type of solid waste.

TABLE V-1

TYPES OF WASTES ROUTINELY COLLECTED IN CITIES

Type of Wastes	Number of Cities	Percentage of All Cities
Garbage	399	100
Rubbish	399	100
Yard Rubbish	310	78
Bulky Refuse	193	48
Commercial Refuse	392	98
Industrial Wastes	250	63

Those cities without a certain type of collection indicate that in a few cases this waste is either not generated or the city is so small that individuals haul their own. For example, of the seven cities that do not collect commercial wastes, five do not have any commercial establishments and two have such small populations that commercial establishments remove the waste themselves.

It was found that 82 percent of the cities (324) serve 90 percent or more of their population whereas only 5 percent of the cities (20) have less than 50 percent of their individual population served with some type of collection. Only one city in California has less than 10 percent of its population using the collection service. A basic city population trend was noted in the percentage of people served in the incorporated areas of the state. A correlation was found to exist between these data and the size of the city population. As the population becomes larger a higher percentage of the population subscribes to the service.

In contrast with refuse collection in the unincorporated areas, city collection usually presents an economic situation that makes collection considerably more feasible. This, coupled with the public health problems and nuisances that would present themselves to a greater degree in a more populated area, has compelled the cities to establish an organized collection system.

2. ORDINANCES

It is essential that every city in California has an ordinance regulating refuse storage and collection for the protection of public health and the prevention of nuisances. At the present time, 361 cities have ordinances regulating collection. The remaining 38 cities have no collection ordinance, although a few are being developed. Unfortunately, there is generally little uniformity as to detail among these many ordinances. The contents range from bare minimum to comprehensive statutes covering all elements of storage and collection.

The distribution of the four basic components of collection ordinances as discussed in the introduction to this chapter are shown in the following table. Most cities have one or more of these requirements in their ordinance.

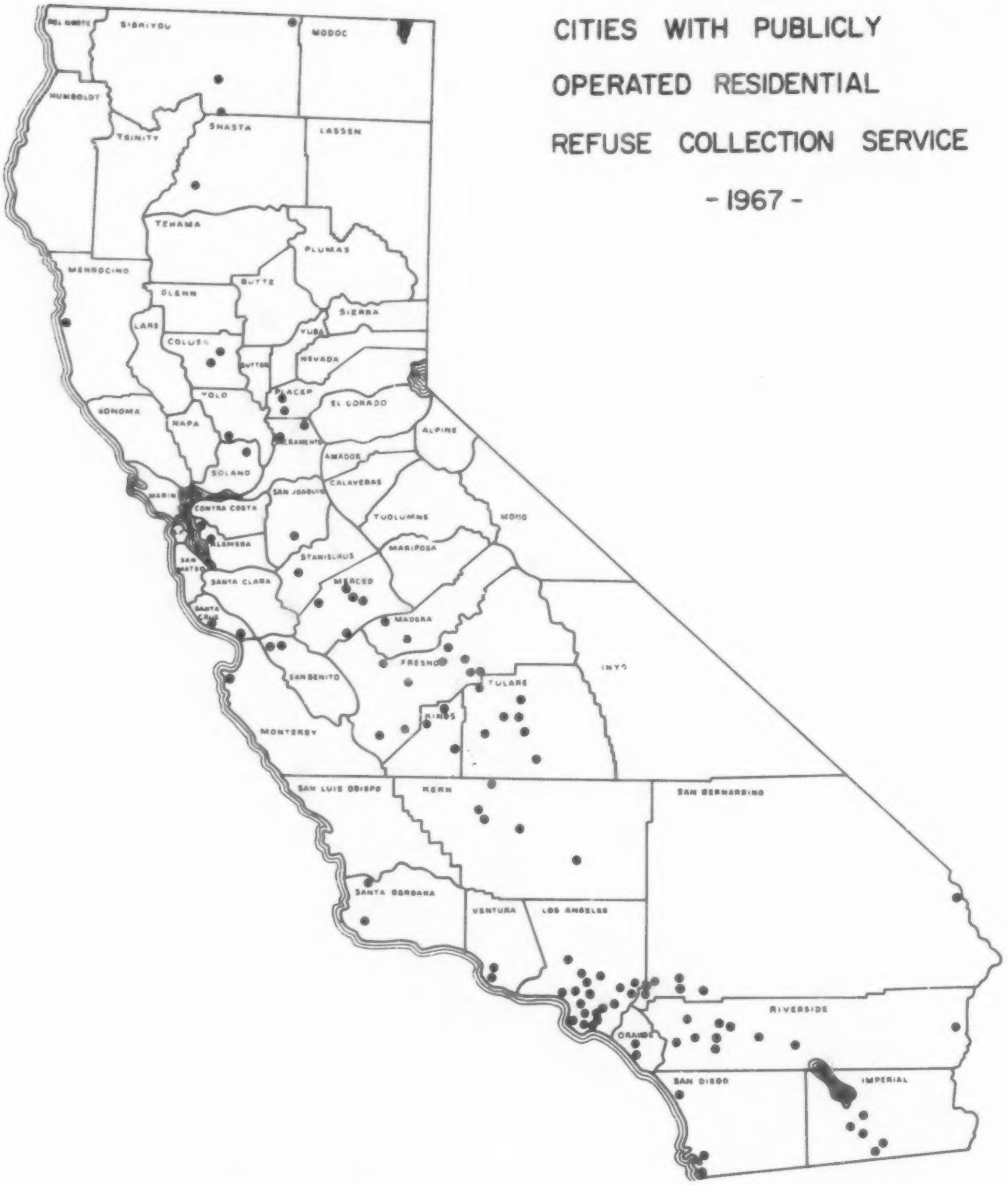
TABLE V-2

CITY ORDINANCE DATA

Component	Number of Cities Including This Item in Ordinance
Frequency of Collection	310
Mandatory Collection	227
Billing	253
Containers	342

3. TYPE OF OPERATOR

A decision regarding collection which confronts city officials is whether municipal crews should do the collecting or whether it should be done by private industry. Residential refuse collection by private firms is the method of choise in 296 (74 percent) of the cities in California. Public agencies collect the residential refuse in 94 cities, whereas another nine cities have a combination (part of city served by public and part by private). Collection by public agencies appears to be more popular with larger cities (10 of the 15 largest cities in California have public collection), with the majority of smaller cities relying on private contractors. Public collection also appears to be more prevalent in Southern California than in the northern part of the state. Figures V-1 and V-2 show the locations of the public and private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LAKE
COLUSA
YUBA
NEVADA
SUTTER
PLACER
YOLO
EL DORADO
SONOMA
NAPA
ALPINE
SACRAMENTO
AMADOR
SOLANO
CALAVERAS
MARIN
CONTRA COSTA
SAN JOAQUIN
TUOLUMNE
MONO
ALAMEDA
STANISLAUS
MARIPOSA
SAN MATEO
SANTA CLARA
MERCED
SANTA CRUZ
MADERA
FRESNO
INYO
SAN BENITO
TULARE
KINGS
MONTEREY
SAN LUIS OBISPO
KERN
SAN BERNARDINO
SANTA BARBARA
VENTURA
LOS ANGELES
RIVERSIDE
ORANGE
SAN DIEGO
IMPERIAL

FIGURE V-1
CITIES WITH PUBLICLY
OPERATED RESIDENTIAL
REFUSE COLLECTION SERVICE
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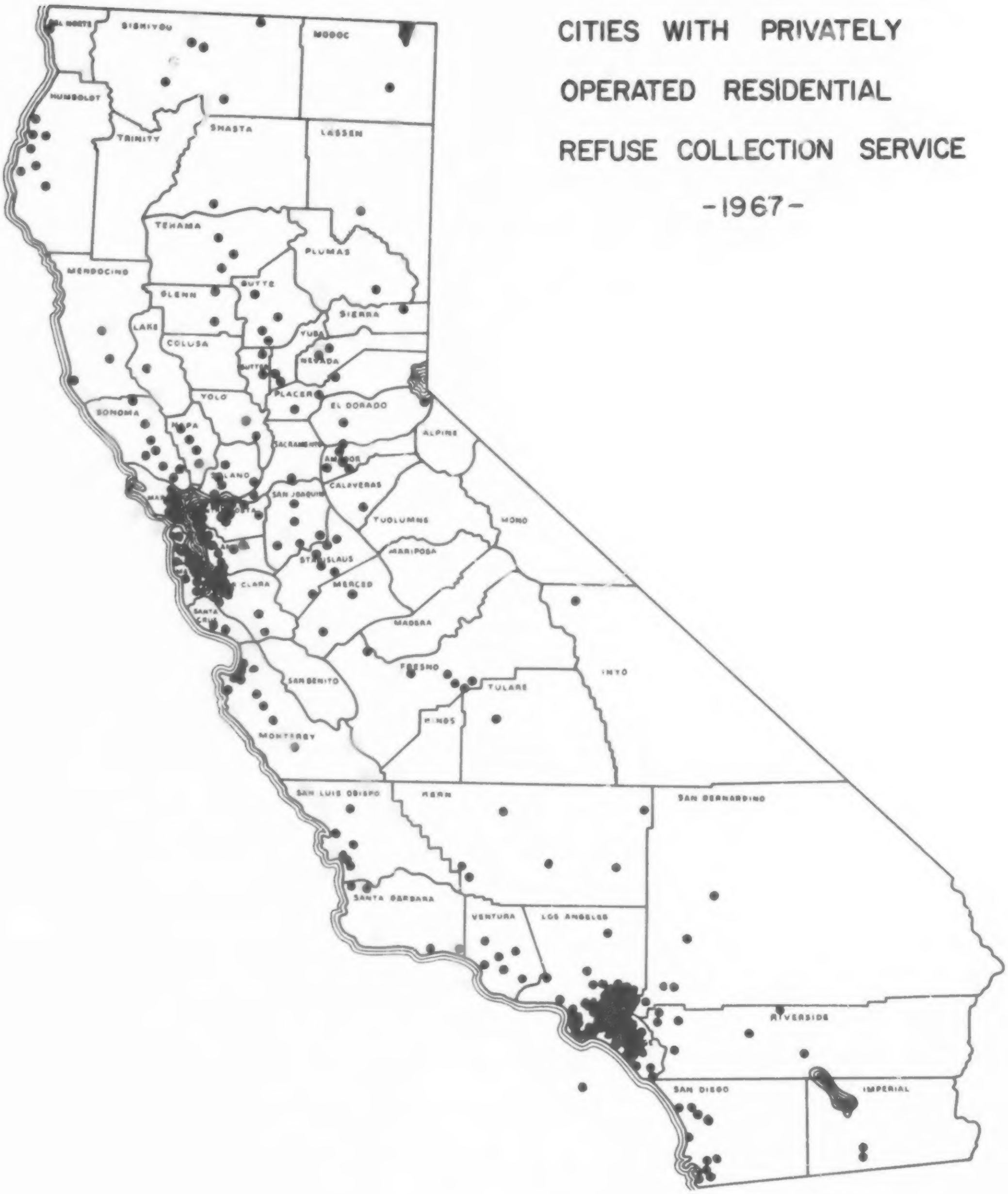
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TULARE
KINGS
MONTEREY
SAN LUIS OBISPO
KERN
SAN BERNARDINO
SANTA BARBARA
VENTURA
LOS ANGELES
RIVERSIDE
SAN DIEGO
IMPERIAL

FIGURE V-2

CITIES WITH PRIVATELY OPERATED RESIDENTIAL REFUSE COLLECTION SERVICE

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residential collection systems. In terms of population served, private industry collects the refuse from approximately 52 percent of the incorporated population. Table V-3 points out the degree of involvement by public and private agencies.

TABLE V-3

TYPE OF WASTE COLLECTED IN CITIES
BY TYPE OF OPERATOR

Type of Waste	Public	Private	Combination	Total
Garbage combined with rubbish	87	267	8	362*
Garbage separately	7	29	1	37*
Rubbish separately	11	25	1	37*
Yard rubbish	106	194	10	310
Bulky refuse	75	110	7	192
Commercial	76	300	16	392
Industrial	40	195	12	247

*Garbage and rubbish are collected in 399 cities -- 37 collect these items separately.

Table V-3 also indicates that the same type of collection agency may not provide collection service for all types of wastes within a city. For example, many cities with public collection of residential refuse allow private companies to collect wastes from commercial and industrial establishments, and cities with a contract for residential refuse collection may have a special yard rubbish collection service operated by municipal crews. With these types of arrangements, a governmental agency may be collecting one type of waste and the private entrepreneur may be collecting another type of waste from the same residence or establishment.

4. CONTROL OF SERVICE

Proper control over refuse collection requires some type of permit system which protects the private hauler who has made a large investment in equipment, and prevents undesirable types of refuse collection. In 281 cities private collectors are required to obtain a permit other than a routine business license. Adding the 94 public collection systems existing in the state to this number results in 375 cities or approximately 95 percent either issuing a permit to the collector or directly operating the system themselves.

Of the 281 cities requiring permits, 256 issue franchises or contracts and 55 issue collection permits. One or both may be issued in a given jurisdiction. These permits in some cases merely guarantee a collector the right to do business in the city. More common, however, is for a city to issue an exclusive franchise to a collector on a 5 to 20-year basis. These are generally obtained by competitive bidding. In a number of cases the cities receive a franchise fee or revenue from the collection in return for the franchise. Some cities do not serve commercial or industrial establishments nor do they issue a franchise for this service. This uncontrolled arrangement has led to the condition where a few cities in the metropolitan Southern California area each has over 50 separate firms competing for the collection of commercial wastes in the city.

In addition to authorizing residential refuse collection by a private collector, a city frequently establishes the area boundaries where he may collect. The methods used by cities to establish these boundaries are listed in Table V-4.

TABLE V-4

ESTABLISHMENT OF RESIDENTIAL COLLECTION AREAS IN CITIES

Collection Area Established by	Number of Cities
Franchise	249
Permit	6
Agency Designation	11
Agreement Among Collectors	7
Uncontrolled	39
Nonapplicable (City Collection)	87

The significant aspect of Table V-4 is the fact that in 46 cities the governmental agency exercises no control over the establishment of collection areas. As an example of this problem, one city in California recently had as many as four refuse firms collecting residential refuse on the same city street. This situation obviously creates an atmosphere of critical competition where none of the firms can provide adequate or efficient service.

From first glance at Table V-4 and the previous paragraphs, it would appear that control over the numerous collectors in the state is adequate. This is not necessarily the case. These previous requirements do not control or establish the performance or conditions under which the collector must operate. In essence, the only controls that frequently exist are in the form of assuring the right of the collector to provide collection for a period of time and in a given location. This is often the only contact the governmental agency has with the collector. His trucks may not be adequate, he may not be disposing of the material in a sanitary manner, and he may not be providing good service to the customer or community.

An interview in one city indicated that the city manager did not even know who the collector was, where he transported the wastes or what he was charging. In fact, the city manager hauled his own wastes to a dump some distance from the city. Whether private refuse collection service or public collection is utilized should be relatively immaterial. Both are capable of providing good service. The need, however, for adequate standards and controls over both types of collection service is essential for the benefit of the community.

5. MANDATORY SERVICE

Even though all cities in California provide for collection of residential garbage and rubbish, not all residents make use of the service. Over 530,000 people residing in the cities of the state do not subscribe to available collection service. This represents approximately five percent of the incorporated population. These people fall into a category of either not wanting to pay the price for the service or preferring to haul their wastes themselves. If a collection system is to fulfill the objective for which it was established, it is essential that all producers of wastes in the city utilize the collection service.

One means of assuring that all waste producers subscribe to the collection service is by means of a mandatory subscription provision in the city ordinance. The major benefits of mandatory collection are as follows:

(1) This is the only means of assuring that all residents are receiving collection service and that refuse is being removed at frequent intervals.

(2) When all residents subscribe to collection service, there is less likelihood of refuse accumulating around the premises. Refuse which accumulates around homes leads to severe fly and rodent problems as well as nuisances from odors.

(3) When rubbish is frequently collected, there is a reduction in

the fire hazard which results from accumulations of such material around the home.

(4) Mandatory service generally reduces the amount of individual back yard burning or burying of refuse. This in turn reduces the nuisances of smoke and odors as well as aiding air pollution control.

(5) When all residents are receiving collection service, there is considerable reduction in the amount of individual hauling of refuse to the disposal site. This reduces the amount of littering caused by refuse being hauled in unsuitable vehicles and illegal dumping. It also tends to reduce the traffic problems at the disposal site which aids in a more efficient disposal operation.

Mandatory collection, unfortunately, is required in only 57 percent of the cities. Mandatory collection commonly appears as a requirement in the larger cities of the state.

6. FREQUENCY AND AMOUNT OF SERVICE

Another important aspect in reducing many public health hazards and nuisances is the volume of wastes which are collected. Since the basic objective of a collection system is to remove all of the wastes of a community, limitations on the volume of wastes collected may lead to many of the problems listed under mandatory collection. Unlimited residential refuse collection service is provided in 178 (45 percent) of the cities. Unlimited collection service means that all of the refuse put out by a customer, regardless of the amount, is picked up at one fixed charge. (For the purposes of this survey, all cities which had three cans or more per week pickup as the basic service were considered to have unlimited collection service.) With unlimited collection, the only restriction is usually that the customer must store wastes in a manner that is easy for the collector to handle. Some cities require that all the material be placed in 30-gallon cans while others merely require the customer to be able to get the waste material to the sidewalk curb, whether it be a sofa, refrigerator, or refuse containers. Unlimited basic service is provided by 58 public agencies, 115 private firms and 6 combination. Therefore, approximately 62 percent of the public collection agencies operate unlimited service while only 39 percent of the cities with private collection have this level of service. Figure V-3 shows the distribution of unlimited collection service in the state. Unfortunately, 180 cities in the state only have one can pickup once a week as the basic service.

The increasing concern over air pollution (in addition to other problems such as odors) has led 158 California cities to pass ordinances banning back yard burning of refuse. While this action is highly commendable, it should also be recognized that it creates more wastes to be collected. Therefore, a higher level of service is needed to remove these additional wastes. Of these 158 cities, 123 or 78 percent have expanded to provide unlimited service. Only three of the remaining 35 have not provided extra service such as two cans, yard refuse pickup or special pickups of any type. It is noteworthy that 106 of the cities with expanded service are located in the Los Angeles County and Orange County Air Pollution Control Districts. Experience in these areas has shown that a ban on back yard burning should be accompanied by an expansion of collection service sufficient to handle resulting increased quantities.

In addition to mandatory subscription and unlimited service, the frequency of refuse collection is important in preventing health hazards and nuisances. Flies, for example, are a major nuisance in most California

FIGURE V-3

CITIES WITH UNLIMITED RESIDENTIAL REFUSE COLLECTION SERVICE

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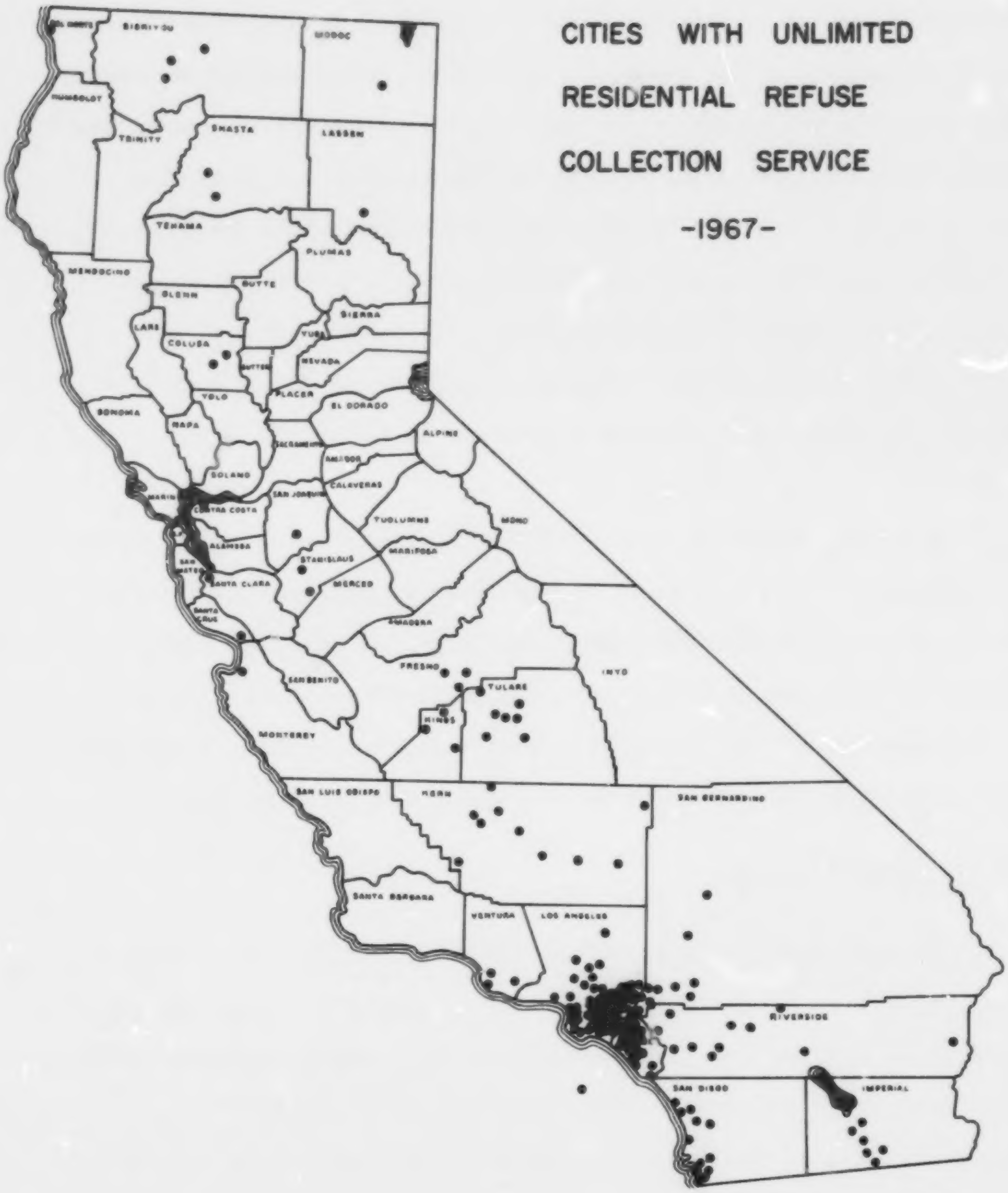
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COLUSA
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SACRAMENTO
AMADOR
SOLANO
CALAVERAS
MARIN
CONTRA COSTA
SAN JOAQUIN
TUOLUMNE
MONO
ALAMEDA
STANISLAUS
MARIPOSA
SAN MATEO
SANTA CLARA
MERCED
SANTA CRUZ
MADERA
INYO
FRESNO
SAN BENITO
TULARE
KINGS
MONTEREY
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SAN BERNARDINO
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communities. Previous studies by the Department have shown that the most significant source of domestic flies in a community is the refuse container. These containers, on the average, produce from several hundred to several thousand flies per container per week on a once-a-week pickup basis. The single most effective means of reducing this prolific fly production is to increase the frequency of pickup to twice a week. This frequency of collection prevents the fly from passing through its entire growth cycle to adulthood. Recent studies conducted by the Department[1/][2/][3/] have shown that the domestic fly population in a community can be reduced as much as 90 percent when collection frequency is increased to twice a week.

At the present time, only 114 cities (28 percent) have twice-a-week residential refuse collection. In addition, 10 cities provide twice-a-week refuse collection during summer months only. Figure V-4 shows the statewide distribution of the cities that have twice-weekly collection. A few desert cities are providing three-times-a-week pickup. These cities are included in the totals for twice-a-week pickup for simplicity.

7. BILLING FOR SERVICE

Table V-5 shows a summary of the methods utilized by the cities in California to bill for collection service. Although 25 cities pay for collection services with general taxes, the most commonly utilized method of billing the customer for refuse collection is a separate bill by the collection agency. Billing in 61 percent of the cities is by this manner.

[1/] D. H. Ecke, et al, "Migration of Green Blow Fly Larvae From Six Refuse Container Systems", California Vector Views, XII, No. 8 (August 1965).

[2/] D. H. Ecke and D. D. Linsdale, "Fly and Economic Evaluation of Urban Refuse Systems (Part 1)", California Vector Views, XIV, No. 4 (April 1967)

[3/] J. D. Walsh, et al, "Fly Larval Migration From Residential Refuse Containers in the City of Fresno", California Vector Views, XV, No. 6 (June 1968).

It is interesting to note that 80 cities, which utilize private collectors, bill the customer by means of a public billing system. This practice appears more prevalent in larger cities.

TABLE V-5

BILLING METHODS USED BY CITIES

Type of Collection	No. of Cities	General Taxes	Public Utility Bill	Separate Bill By City	Separate Bill By Collector
Public Agency	94	11	69	14	0
Private Firm	296	14	56	10	216
Combination	9	0	6	3	0
Totals	399	25	131	27	216

The billing method which appears to be working the most satisfactorily for collection is a charge on the public utility bill. By this method every occupied residence and establishment is billed automatically whether it uses the refuse collection service or not. If the customer fails to pay the utility bill, all utilities are discontinued (water, etc.). This, incidentally, is an excellent means of enforcing mandatory collection of refuse. The general tax method affords the same incentive to use the service in that the customer automatically pays for the service even though he may not use it. This billing method is not limited to public refuse collection as there are 14 cities with private refuse collection using this method.

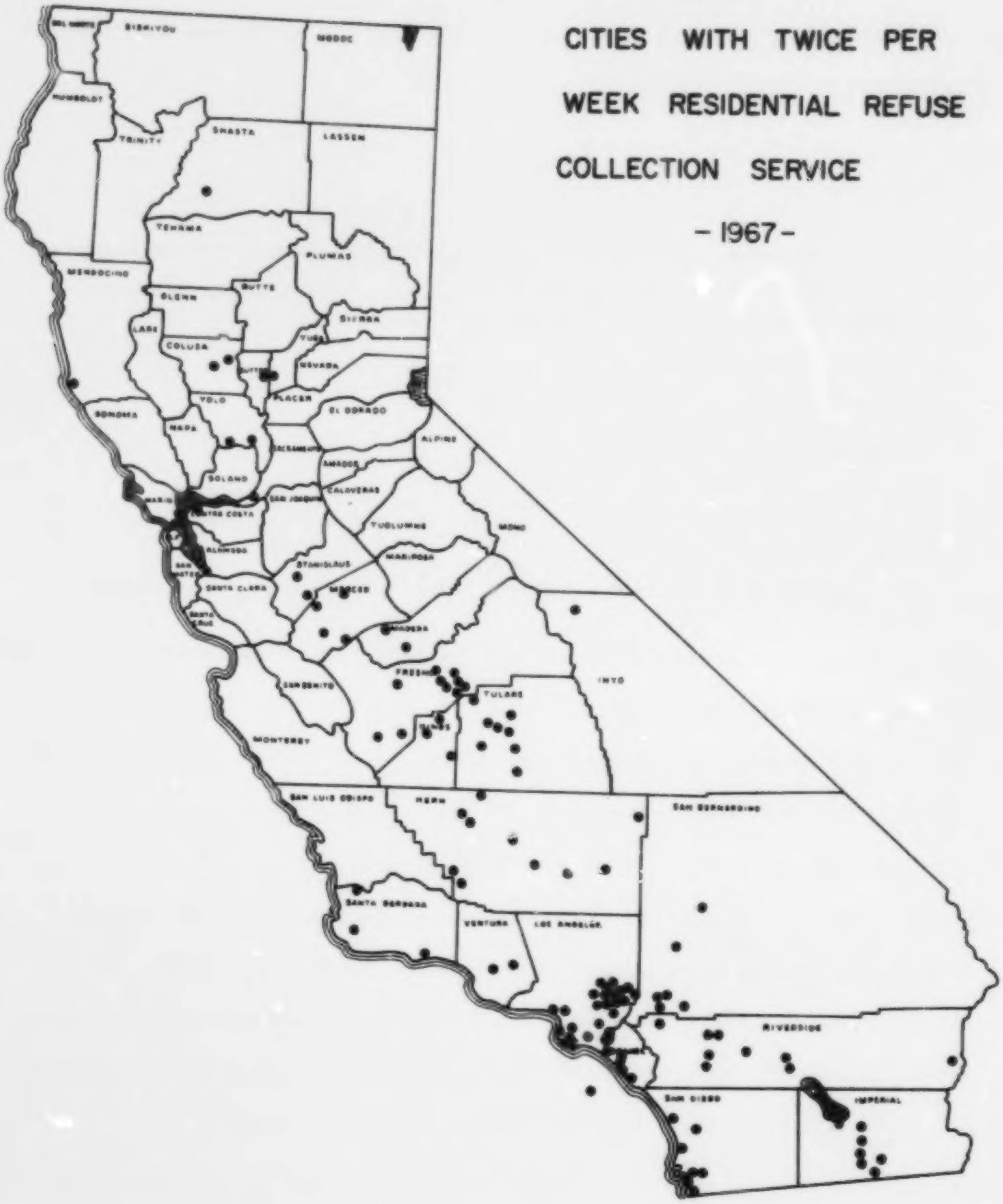
C. COLLECTION PRACTICES IN UNINCORPORATED AREAS

Collection in the unincorporated areas is not organized as well as in the cities of the state. This results from the sparse population in many

FIGURE V-4

CITIES WITH TWICE PER WEEK RESIDENTIAL REFUSE COLLECTION SERVICE

- 1967 -


DEL NORTE
SISKIYOU
MODOC
HUMBOLDT
TRINITY
SHASTA
LASSEN
TEHAMA
PLUMAS
MENDOCINO
GLENN
BUTTE
SIERRA
LAKE
COLUSA
YUBA
NEVADA
SUTTER
PLACER
SONOMA
YOLO
EL DORADO
NAPA
SACRAMENTO
ALPINE
AMADOR
SOLANO
MARIN
CONTRA COSTA
SAN JOAQUIN
CALAVERAS
TUOLUMNE
MONO
ALAMEDA
SAN MATEO
STANISLAUS
MARIPOSA
SANTA CLARA
MERCED
SANTA CRUZ
MADERA
INYO
FRESNO
SAN BENITO
TULARE
KINGS
MONTEREY
SAN LUIS OBISPO
KERN
SAN BERNARDINO
SANTA BARBARA
VENTURA
LOS ANGELES
RIVERSIDE
SAN DIEGO
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of the rural unincorporated areas. Since service to these residents is not economically attractive, inhabitants must haul their wastes to the nearest disposal site.

1. EXTENT OF SERVICE

In the unincorporated areas of the state, approximately 65 percent of the population has residential collection service. This leaves 1.7 million people without refuse collection service. At the time of the survey, one county government (Sacramento) was in the process of initiating a public collection service. The remaining counties are either served by private firms or no collection service exists. This collection service usually covers the areas that fringe on cities or those areas with a population density sufficient to economically support routine collection. Outlying areas receive little or no service.

2. ORDINANCES AND CONTROL

Only 42 counties have ordinances which regulate the storage and collection of refuse. Table V-6 categorizes the four components contained in the ordinances and indicates the number of counties which include each component.

TABLE V-6

COUNTY ORDINANCE DATA

Component	Number of Counties Including This Item in Ordinance
Frequency of Collection	21
Mandatory Collection	4
Billing	8
Containers	23

Sixteen counties in California have no solid waste ordinance; however, 10 of these have indicated plans to develop one. These plans span the total spectrum of actively writing an ordinance to merely thinking about one. Thirty-seven of the counties require the collector to obtain some sort of permit other than a routine business license. These permits are in the form of contracts, exclusive franchise, collection permits, or vehicle permits. A county may require a collector to have more than one type of permit. Fifteen counties issue contracts or franchises, 31 require collection permits, and 21 counties do not require any form of permit. Various county agencies issue these permits. The two most common are the county health department (21 counties) and board of supervisors (19 counties).

Collection areas in the unincorporated portions of the county are established by different methods as shown in Table V-7.

Table V-7

METHODS OF ESTABLISHING RESIDENTIAL COLLECTION AREAS IN UNINCORPORATED AREAS

Collection Area Established by	Number of Counties
Franchise	17
Specified by County Permit	9
Agency Designation	2
Agreement Among Collectors	6
Uncontrolled	22
Not Applicable	2

The two counties that are in the "not applicable" classification include Modoc and Sierra. These counties do not have any organized collection service available to the people in the unincorporated areas.

3. FREQUENCY AND AMOUNT OF SERVICE

The level of residential service in the unincorporated areas of the state is basically one can collected weekly. The counties of Kern, Kings, and Imperial are the only jurisdictions with a frequency of collection greater than weekly. In ten counties the basic collection service includes the pickup of more than one container. Seven of these are unlimited collection systems which generally restrict the customer to the size of discarded items, but not the number of containers. Table V-8 lists the counties and the level of service they maintain.

TABLE V-8

BASIC LEVEL OF RESIDENTIAL COLLECTION SERVICE
IN UNINCORPORATED AREAS

No Service	One Can	Two Can	Unlimited	
Modoc	46 Counties	Lake	Colusa	Kern
Sierra		Merced	Del Norte	Mariposa
		Santa Barbara	Fresno	Orange
			Imperial	

D. COLLECTION PRACTICES IN DISTRICTS

There are 1,162 special districts (13 types) in the state which may legally be involved in solid waste management. As outlined in Chapter IV, ADMINISTRATION AND CONTROL OF SOLID WASTES, 148 special districts (4 types) are restricted from collecting wastes. The remaining 1,014 special districts are empowered to collect or contract for collection of refuse within their jurisdiction. The garbage disposal district is the only type of district that can be formed that has the sole purpose of refuse management. All of the other types of special districts have broader interests in which refuse handling is only an additional function.

The gathering of complete information on all special districts was considered to be impractical. This was based on their varied responsibilities and the fact that many county officials did not know the degree of involvement of the local districts. The following data reflect only the information obtained from the ten garbage disposal districts in the state. Of these ten districts, only one (Cambria Garbage Disposal District, San Luis Obispo County) operates the collection service. The nine other garbage disposal districts contract or franchise with private collectors to provide the service. Eight of these are located in Los Angeles County.

Collection service in nine districts is paid for by means of general taxes, with reimbursement to the private collector. In the other district (Atascadero Garbage disposal District, San Luis Obispo County) the private collector bills the customers directly.

The frequency of service in the districts includes four districts with once-a-week collection and six with twice-a-week collection. All districts, but one, provide for the collection of an unlimited quantity of refuse.

Of all the other special districts, only 31 districts were identified during the survey as being involved in residential refuse collection. These districts are primarily sanitary districts and a few community service districts. The low number is considered to represent the order of magnitude of active participation on the part of the various special districts. The involvement of most of these districts is limited to enacting a minimum solid waste ordinance and issuing a franchise for collection in their service area. A few districts, however, were found to operate the collection service. These districts primarily serve more densely populated unincorporated areas, although a few districts have continued in this function after incorporation of part or all of the district area.

Detailed evaluation and inventory of various types of collection equipment in use in the state is beyond the scope of this survey. However, it must be clearly pointed out that collection practices and various equipment usage is an integral part of the total management system.

Equipment varies over the state from the most recent and sophisticated models to old open trucks converted for collection of solid wastes. The lack of uniformity in types of equipment used throughout the state is due to the peculiarities and preferences of each area. These differences, such as length of haul, condition of streets and alleys, population density, method of collection, type of material collected, collection frequency, and financial abilities of the collector, dictate what type of equipment is to be used. In general, development of collection equipment has been slow and has not kept pace with advancing technology in other fields. Only within the last few years has there been any measurable effort in the development of more efficient and specially designed vehicles. Even with new equipment being developed, there are still many unsanitary open trucks in use which not only create public nuisances, but also promote potential public health hazards. The unrestricted use of this type of vehicle should not be tolerated by any community.

One consistent trend is apparent -- the growing use of compacting vehicles for items other than large, hard-to-handle wastes. This type of truck uses a packing device, either hydraulic or otherwise, to compact more material into a given volume. These vehicles may utilize one-man, two-man or three-man crews and be of the front, side or rear loading type units.

Additional vehicles have been developed for the handling of special wastes such as manures, sludges, etc. Although this type of equipment has not been investigated in any detail, attention must be given to the hauling of these wastes by a community.

Containerization is playing an important role in the storage and design of collection equipment. Large containers or bins are used in commercial, industrial, multiple dwelling, and other establishments producing large volumes of wastes. These containers range in size from one to fifty-yard capacities. The economics of utilizing containerized systems is quite significant. The time required to empty one large container is much less than that required for numerous smaller containers.

Local governmental control of refuse vehicles is almost nonexistent throughout the state. Some of this is due to the fact that the state vehicle laws have preempted local government from adopting certain refuse vehicle requirements. Little attention is given, for example, to the type or condition of vehicle being used.

F. TRANSFER FACILITIES

The use of transfer facilities to transport refuse from collection vehicles to the disposal facility has reduced the long haul and corresponding high costs of collection. As urban areas force disposal facilities farther from the source of waste generation, the collector must spend more time hauling refuse to the disposal site. The establishment of transfer stations reduces this waste of man power and affords a more efficient use of collection equipment. In many instances the collector may save a round trip haul distance of 50 miles or more.

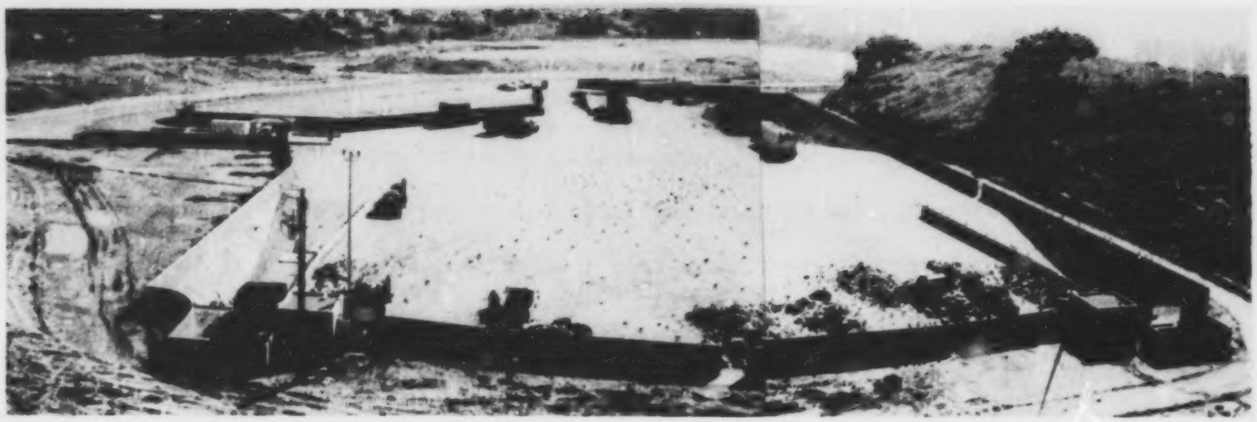
For this report, a transfer station is defined as any facility operated for the purpose of transferring refuse from collection trucks and other vehicles to larger capacity trucks. These larger units, ranging in size up to 120 cubic yards, with a legal limit payload of about 20 tons, transport the refuse to the disposal facility.

As shown in Table V-9, there are 21 major transfer stations in the state. These handle nearly 900,000 tons of refuse per year. This represents approximately four percent of the total wastes hauled to general use disposal sites. In addition to these 21, there are numerous other stations operated by cities for the transfer of city street sweepings, tree trimmings, and other related wastes. These were not surveyed and have been categorized as "supplemental transfer stations". It is estimated that as many as 50 of these stations may exist in California.

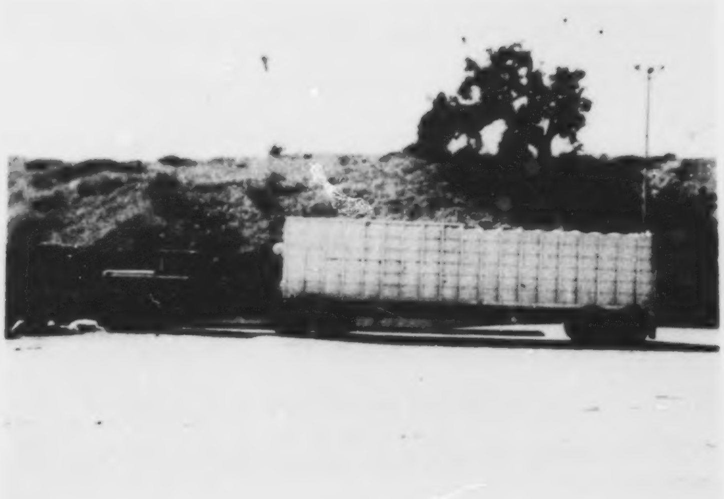
It should be pointed out that the five largest transfer stations handle nearly 80 percent of all the wastes transferred in the state. These are county or district-operated facilities which were planned and constructed as part of the county plan for municipal refuse disposal. Six of the reported transfer stations are small private operations in the City of Los Angeles, primarily for the use of gardeners and haulers of small amounts of demolition wastes. In addition, two are transferring only wet garbage or swill. This material is being hauled to hog ranchers for use as hog feed. Only five of the 21 transfer stations are located outside of the Los Angeles-Orange County area, and only four of these are located in the central or northern parts of the state.

As shown in Table V-9, there is no uniform pattern to the length of haul distances to disposal facilities. The economical justification is not necessarily the number of miles to the disposal site but must also consider the haul time, ease of hauling, price set for receiving the wastes, and types of wastes a disposal facility can accept.

Railroads are also being considered in addition to the conventional



TRANSFER FACILITIES



Typical closed transfer truck.

Collection vehicles dumping directly to transfer trailers.

TABLE V-9

TRANSFER STATION DATA

County	Transfer Station Name	Operator	Quantity (Tons/Year)	Type of Waste	Public Allowed	Distance From Site (Miles)
Alameda	Davis Street	Private	9,000	Swill	No	40
Fresno	Del Rey	Private	32,800	Refuse	Yes	22
Los Angeles	Alhambra	Private	2,400	Refuse	Yes	8
	South Gate	District	68,200	Refuse	Yes	20
	Santa Monica	City	52,100	Refuse	Yes	10
	Wilco Disposal Co.	Private	3,600	Rubbish	Yes	25
	Beverly Hills	City	27,500	Refuse	Yes	11
	Kingsley-Olympic	Private	500	Yard Refuse	Yes	-
	Los Angeles Rubbish Transfer	Private	1,300	Yard Refuse	Yes	30
	Los Angeles Rubbish Transfer	Private	600	Yard Refuse	Yes	40
	Los Angeles Rubbish Transfer	Private	600	Yard Refuse	Yes	40
	Daily Disposal Service	Private	6,300	Refuse	No	8
	Los Angeles Public Works	City	14,000	Swill	No	-
	Tom Matsushita	Private	500	Yard Refuse	Yes	-
	George Furagawa	Private	500	Yard Refuse	Yes	-
Orange	Station No. 1	County	156,000	Refuse	No	25
	Station No. 2	County	144,200	Refuse	No	15
	Station No. 3	County	169,500	Refuse	No	13
Sacramento	Sacramento Waste Disposal Company	Private	31,200	Refuse	No	23
San Joaquin	Lovelace	Private	11,300	Refuse	Yes	25
Santa Barbara	Cathedral Oaks	County	140,000	Refuse	Yes	22

truck transfer systems in use. In this manner, undeveloped lands located several hundred miles from metropolitan areas might be used as disposal areas.

Transfer facilities should be planned and developed as part of the overall solid waste management plan. In essence, the option of transfer and economical haul permits increased latitude in regional solid waste management planning.

VI. SOLID WASTE DISPOSAL

Past history of solid waste disposal has been limited primarily to the disposal of municipal refuse by the primitive methods of dumping on land or open burning. Due to the revolutional development in the urban-industrial-suburban complex, many other types of solid wastes are now becoming an increasing burden on the community. Demolition, industrial and agricultural wastes must now be included in the solid waste management system. Coupled with the additional types of solid wastes requiring handling, is the increasing quantity of wastes being produced as a result of population growth and per capita increases. An additional adverse factor involved in the solid waste management scheme is lagging technology in the field of solid waste disposal.

Solid waste disposal is restrained by the fundamental fact that ultimate disposition of the wastes must be through reutilization, conversion, or to one of two receptacles, the land or the ocean. With the exception of dumping at sea, all processing or disposal methods currently being considered require disposal to land of some percentage of the original waste (a major percentage). Current disposal methods involve some variation of burning or burying and in a few situations organic conversion. With the increasing awareness of the public regarding resources management and environmental quality, an accelerated program of research in solid waste disposal technology is underway and new techniques may be developed to arrest the growth of the solid waste disposal problem.

A. DISPOSAL MANAGEMENT

Disposal management is the provision of a long-range, comprehensive solid waste disposal program which meets acceptable criteria for environmental quality, public health, social aesthetics, and economic efficiency.

With the exception of the two heavily-populated metropolitan areas, disposal sites have been developed to receive municipal wastes for each city largely on an individual basis. Since these sites do not accept all of the wastes generated, numerous other sites are often developed to receive specialized materials such as demolition debris and industrial wastes. These special use sites are not included in the waste disposal plan of the jurisdiction. In the unincorporated county areas, disposal sites are usually distributed in a manner to serve the small individual centers of population. Although these sites are often located in agricultural areas, they frequently exclude agricultural wastes. The disposal of agricultural wastes currently remains the responsibility of the producer.

Cooperative agreements between jurisdictions to share disposal sites are lacking in most sections of the state. In some instances, two neighboring cities operate separate disposal sites on adjacent pieces of property. Also, cities often do not allow the residents or collection agencies in the unincorporated fringe area to use the city's site; therefore, another site must be located nearby in the county area. The lack of cooperation stems primarily from reluctance to relinquish authority to another jurisdiction and the hesitancy to allow "other people's garbage" to be imported into their city. There are only 257 disposal sites (out of 716) in the state which serve more than one jurisdiction. The majority of these multiple-use sites are found in large metropolitan areas and are often privately-owned and operated.

Local regulations of disposal site operations are extremely inconsistent, and for the most part, generally lacking. A striking reaction which was evident from the survey was that the attitude of many counties (and local governmental officials in general) toward solid waste disposal was a lack of concern; phrases which describe this apathy might include: "out of sight -- out of mind", "use the least expensive disposal method", "let someone else handle it", and "keep us out of the disposal business".

Where regulations do exist, they are in the form of zoning requirements, land-use permits, disposal site permits, and solid waste disposal ordinances. Some solid waste disposal ordinances outline the approved methods of disposal and requirements for disposal site operation. In some instances, the land-use permit is used to regulate the operation of a disposal site by writing disposal site requirements into the permit as conditions which must be maintained. Controls may also be incorporated into a contract or agreement between the local jurisdiction and private operators of sites.

Of the 42 counties having solid waste ordinances, only 17 include disposal regulations. These regulations frequently stipulate only the method of disposal to be used. Thirteen counties have actual solid waste disposal standards although these are not always enforced. Most of these standards consider only a limited number of items, generally including: intervals between covering, limiting access, control of rodents and control of fires. Most county disposal standards do not apply to incorporated areas and state and federal operations. A few county ordinances go so far as to specifically prohibit the importation of refuse. While the majority of solid wastes produced in a county are disposed of within the county, an illustration of the high degree of intercounty transfer of refuse is the fact that 25 counties currently export some refuse to neighboring counties.

Disposal of food processing wastes and agricultural crop wastes by spreading on land is common in many agricultural areas of the state. Animal manures from cattle feedlots, dairies, egg and poultry establishments are also commonly spread on land or heaped into large piles. The adequate regulation of the disposal of these wastes is lacking in almost all counties of the state. Those few counties with controls have instituted regulations only because of overwhelming environmental problems and after considerable public complaints.

The necessity of having a collection service in dense population areas is generally recognized. After the waste is collected, however, most cities tend to ignore the disposal process. In some cases, local agencies have established policies and standards for improved operations only to find neighboring jurisdictions unwilling to meet the same goals and their own efforts are thus defeated. Locating disposal sites within city limits is regarded with considerable disfavor by city officials to the extent that city zoning laws often discourage this type of activity. Because of this attitude, 366 of the 399 cities in California dispose of some or all of their wastes outside their city limits. In one-third of the cities, existing zoning regulations do not allow the establishment of a disposal site.

The obvious fact emerging from the confused status of solid waste disposal management is that it should be without question the responsibility of government to protect the health of its citizens by providing adequate waste disposal service for the community, for refuse as well as for sewage. Whether this responsibility is met by suitable arrangements with private firms, other jurisdictions, or whether a jurisdiction operates its own disposal service is immaterial, as long as the responsibility is met. Private industry has long assumed the burden of this responsibility in some areas of the state. The responsibility for health protection of the public should not, however, be totally delegated by public agencies to private interests.

B. METHODS OF PROCESSING OR DISPOSAL

There are many factors which may affect the type of disposal method utilized. The acceptance or rejection of a particular processing or disposal method may depend upon: (1) the technical limitations of the system; (2) specialized local conditions; (3) public health criteria; (4) economic considerations; (5) public acceptance and aesthetics; (6) type of collection system; (7) characteristics of the wastes; and (8) governmental regulations.

The methods of disposal described in this section should not be considered as absolute systems in themselves but should be viewed as eligible choices in a comprehensive system which might employ a combination of these methods. This section will discuss those methods of solid waste processing or disposal currently in use or applicable to California. These methods include landfilling, incineration, composting, grinding to sewers, salvage and reclamation, ocean disposal, open burning, pyrolysis, animal feeding, and disposal on fields.

1. LANDFILLING

Landfilling is the most widely used method of solid waste disposal throughout the state. Detailed information was obtained on the 716 general solid waste disposal sites in use during 1967. Information on 284 of the more than 500 supplemental sites in existence was also collected. The distribution and location of all disposal sites on which information was obtained is shown in Appendix C.

The landfill method has the advantages of being inexpensive and applicable to a wide variety of terrains. It may be utilized in low swampy areas or tidelands to raise the elevation and reclaim the land for other use. It may also be used in steep terrain to fill canyons or depressions. The popularity and widespread use of landfill disposal has been due to:

(1) The availability of suitable low-cost land such as canyons, nonproductive lands, and marshlands.

(2) Low capital outlay and cost of operation.

(3) Traditional acceptance by the public.

(4) Its adaptability and flexibility to accept a wide variety of wastes of varying composition and amount with no pretreatment required.

Some of the disadvantages and problems encountered by this disposal method are:

(1) Rising land costs and critical competition for usage of available land resulting in difficulty in site acquisitions.

(2) Growing pressure by conservation interests against use of certain open spaces as disposal sites.

(3) Increasing urban pressure requiring more stringent operating controls.

There are several classes or types of landfills ranging from sanitary landfills down to open dumps. These two extremes illustrate the range between "controlled" and "uncontrolled" landfilling. Controlled landfills include those sites at which all or most of the materials are routinely buried. As the name would imply, control is exercised over the wastes; type of materials accepted at the site may be restricted; dumping operations are confined to one portion of the site; and a program of compaction and covering retains materials in the site. Terminology used in this report to designate specific types of controlled landfills includes "sanitary landfill", "modified sanitary landfill", and "modified sanitary landfill with burning". Uncontrolled landfills include the open burning dumps at which control of the solid wastes is virtually lacking. Terms used in this report to designate these sites are "uncontrolled burning dump" and "supervised dump with burning".

The most acceptable form of landfill, from a public health point of view, is the sanitary landfill. Although a number of specific variations in construction procedure are used depending on the terrain, it is generally a process of dumping and compacting the solid wastes to the smallest practical volume and covering them daily with compacted earth in a systematic and sanitary manner. In this method, wastes are spread in thin layers, and compacted by mechanical equipment until a lift 5 - 15 feet deep is achieved. At the end of each day an intermediate earth cover is applied and compacted. Subsequent lifts of refuse may be placed over each lift with intervening layers of earth cover until the height limit of the site is reached. Final cover of the fill consists of a minimum of two feet of compacted earth. While landfill is by far the most commonly used method of disposal, only 67 sites in the state were classified as sanitary landfills. Figure VI-1 shows the location of these 67 sites. As readily seen on the map, the majority of the sanitary landfills in the state are located in Southern California. In fact, 55 percent of the sanitary landfills in the state are located in Los Angeles and San Diego counties. The reasons for this are primarily the great population density in these areas and the high degree of control by the local programs.

The more common form of controlled landfilling encountered in California is some type of "modified" sanitary landfill (138 sites). This form of landfill involves periodic covering of the refuse but not usually at daily intervals. Included are sites where the top surface of the fill is covered each day, but the face of the fill is left open. Also included are the sites where the fill is only covered every two or three days. In essence, a modified sanitary landfill follows the sanitary landfill construction procedures with the major exception of daily covering of all exposed solid wastes. This kind of operation is not compatible with urbanized land use. There may also be some burning of selected combustible materials at modified sanitary landfills, such as seasonal accumulations of brush and hard to handle items such as long pieces of lumber.

Open dumps (the opposite of "controlled" landfills) are the most prevalent type of disposal site used in the state. All but seven counties have at least one such operation with a statewide total of 511 sites (71 percent). This type of operation is usually accompanied by continuous or periodic burning and these disposal sites have minimal organization and operating procedure. The refuse is dumped on the ground, over a bank or into a trench and burned in place. In many sites equipment is used only when dumping or entrance to the site is impaired by the accumulation of burned-over refuse.

The large number of open dumps found in California is due to:

(1) Minimum amount of land required.

(2) Essentially no development or operating cost.

(3) Lack of environmental quality control standards.

This type of disposal site has many disadvantages, some of which are:

(1) Creation of health and safety hazards through breeding of flies and rats; air pollution; odors and unsightliness.

(2) Creating land blight and reduction of adjacent property values.

(3) Increasing urban pressure requiring more remote location of these sites and difficulty in obtaining sites.

(4) Generally poor aesthetic conditions.

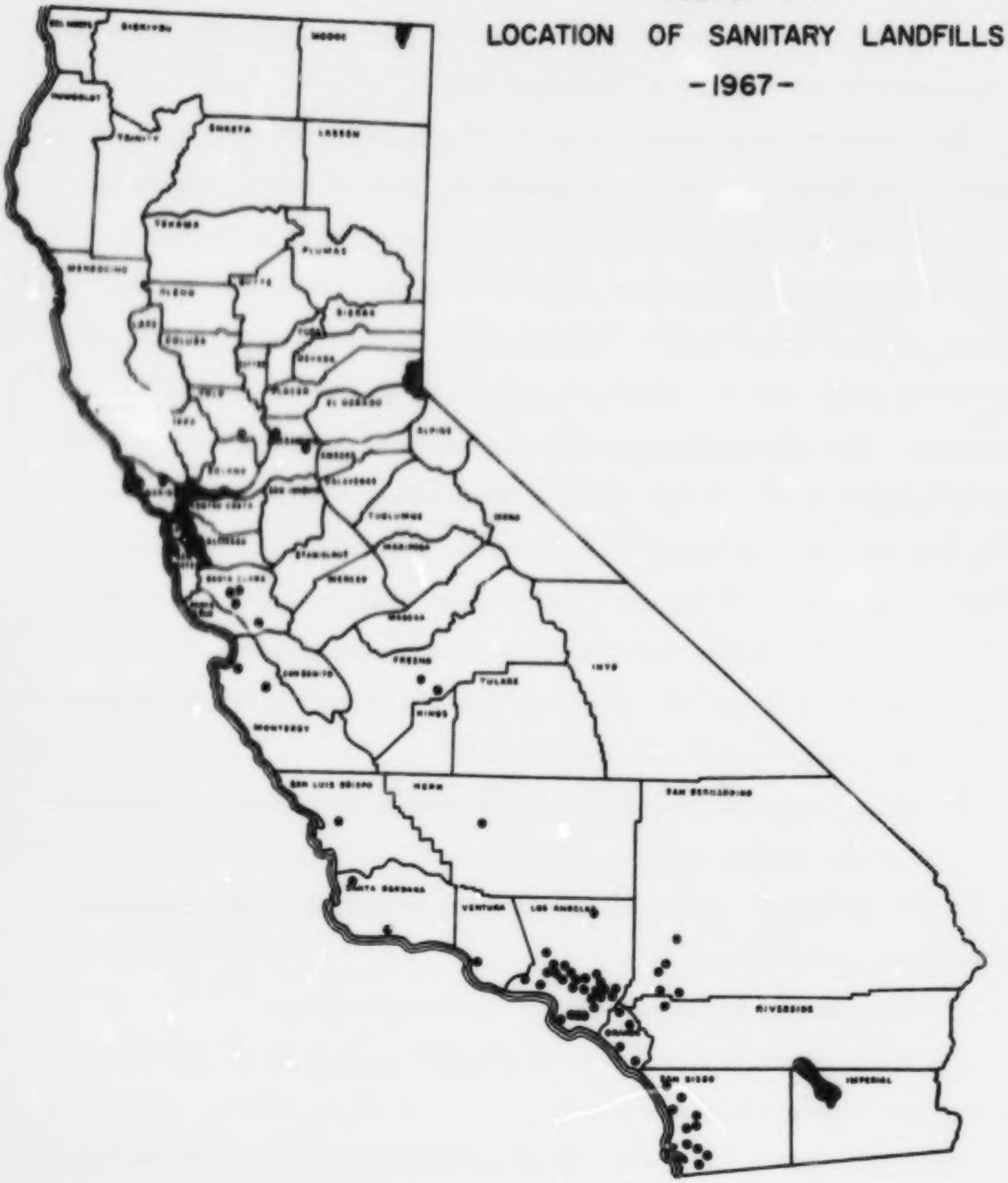
2. INCINERATION

Incineration, as applied to the disposal of solid wastes, is the process of burning solid or semi-solid combustible wastes to an inoffensive gas and

FIGURE VI-1

LOCATION OF SANITARY LANDFILLS

-1967-


SISKIYOU
MODOC
HUMBOLDT
TRINITY
SHASTA
LASSEN
TEHAMA
PLUMAS
MENDOCINO
GLENN
BUTTE
SIERRA
LAKE
COLUSA
NEVADA
PLACER
EL DORADO
ALPINE
SOLANO
CONTRA COSTA
TUOLUMNE
MONO
STANISLAUS
MARIPOSA
SANTA CLARA
MERCED
MADERA
FRESNO
INYO
TULARE
KINGS
SAN BENITO
MONTEREY
SAN LUIS OBISPO
KERN
SAN BERNARDINO
SANTA BARBARA
VENTURA
LOS ANGELES
ORANGE
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a residue containing little or no combustible material. Open burning is not considered incineration, and single chamber incinerators have been found to be unacceptable for disposal of municipal wastes.

Many types of solid wastes cannot be economically processed in an incinerator. The wastes may have to be pretreated, such as dried, reduced in size or segregated. Noncombustible wastes are essentially unaffected by incineration and must by-pass the incinerator (such as concrete, etc.). Residue (ash and noncombustibles) from an incinerator processing municipal refuse will range between 5 and 15 percent of the volume of the original quantities. The residue combined with the by-passed materials will approximately be one-half of all the municipal solid wastes. This quantity must still be disposed of, normally in a landfill. Incineration, therefore, should not be considered a means of disposal itself but rather as a technique to reduce the volume of wastes going to ultimate disposal.

The principal advantages of incineration may be summarized as follows:

(1) Less land is required for disposal.

(2) Incineration may take place at a close,centralized point, reducing collection haul costs.

The disadvantages listed below must be weighed against the advantages and possible other methods.

(1) High capital outlay and cost of operation.

(2) Possible source of air contaminants and loading on the atmosphere.

(3) Not a complete disposal method.

There are no municipal incinerators operating in the state at the present time. A few municipalities have attempted incineration in the past, notably the cities of Los Angeles, Pasadena, and San Francisco, but these operations have been discontinued. It appears that the chief deterrent to municipal incineration is the high cost. Much of this high cost is the result of strict air pollution requirements.

There are numerous incinerators utilized by various institutions, commercial and industrial establishments and federal facilities in the state. Some of these installations have capacities as large as 40 to 50 tons per day. A few wood waste burners are closer to 100 tons per day; particularly those that are incorporated into a steam generating complex. One popular type of incineration in the form of teepee burners is extensively used by the lumber industry to dispose of sawdust and wood wastes. It is estimated that there are approximately 500 of these in present use throughout the state, disposing of over three million tons of wood waste each year. Smaller incinerators are often used by schools, shopping centers, etc., for the incineration of paper and other combustibles. Many hospitals use special incinerators in order to dispose of infectious and hazardous wastes. Residential back yard incinerators, while used extensively throughout the state, are unsuitable for urban areas because conditions for adequate combustion cannot be provided economically. A number of air pollution control districts and municipalities have banned back yard burning because of the nuisances created by this practice.

3. COMPOSTING

Composting is the aerobic, biological decomposition of solid organic material under controlled conditions. The objective of composting is to convert the organic matter to a nuisance-free, humus-like end product which can be used as a soil conditioner or a fertilizer base.

Composting, like incineration, cannot be considered an ultimate disposal method inasmuch as inorganic material must be disposed of by other means. Therefore, compostable materials must either be collected separately or the total refuse must be processed by sorting and other separation procedures to reduce the amount of noncompostables. Composting, therefore, is often conducted in conjunction with the salvage of certain materials for which there is a market. Many types of organic wastes such as food processing wastes, manures, crop residues and sewage sludge are amenable to aerobic decomposition and may be composted individually or with the compostable refuse. At the present time much research is being conducted relative to composting sewage sludge in combination with refuse.

While composting has been successful to a limited extent in Europe, there have been few successful, large-scale operations in the United States. A substantial number of pilot plants have been constructed and operated at various times.

In general, the problems seem to be more economic than technical. The advantages are:

(1) Conserves resource material.
(2) Provides a useful end product.
(3) Reduces initial volume of wastes.
(4) Centralized processing may reduce haul distances.

The disadvantages of the system are:

(1) High capital and operational costs for mechanical equipment.
(2) The major problem of finding markets or outlets for the final product.

Composting of refuse at the present time is finding limited application in California. A mechanical municipal refuse composting operation utilizing the Dano process was attempted in Sacramento. This pilot plant operation which processed 40-50 tons of refuse daily operated from 1956 to 1963. During 1963-64 a 70-ton-per-day composting plant was operated in San Fernando.

At the present time the only composting conducted in California is in the area of special wastes, such as sewage sludge, animal manures and food processing wastes.

4. GRINDING TO SEWERS

Selected refuse can be disposed of by grinding it and flushing the garbage slurry into the sewerage system with ultimate delivery to the sewage treatment plant. Grinders are currently used throughout the state in homes and in commercial establishments, such as restaurants, produce terminals, and supermarkets. These installations are operating with satisfactory results. Grinders in centrally-located stations operated by a municipality have been utilized in the East. The Los Angeles County Sanitation Districts have experimented with the grinding and transport in sewers of household refuse.

The principle of the operation is the same for all: garbage is stored or collected separately from other refuse; it is ground or shredded in the grinder as water is added and flushed into the sewers. Very little waste material other than garbage is committed to a home disposal unit. Commercial or municipally-operated units, however, would be required to accept garbage and selected refuse. Preliminary sorting or salvage is necessary for all operations in order to prevent damage to the equipment.

In general, new subdivisions include a home-installed garbage disposal unit as part of a packaged, modern, built-in kitchen. There are no municipal or private collection agencies operating central-grinding installations in the state.

This method has the advantages of:

(1) Garbage storage on premises is eliminated.

(2) Amount of putrescible wastes transported throughout the community in trucks is reduced.

(3) Convenience to the waste producer.

The disadvantages are:

(1) Increased loading on sewerage system and sewage treatment facilities.

(2) Increased water pollution threat.

(3) High cost per unit treated.

5. SALVAGE AND RECLAMATION

The terms salvage and reclamation include a number of disposal processes: sorting of refuse for metals, tin cans, glass, paper and cardboard that may have a local market; reduction of garbage or rendering of animal wastes for fats, tankage and other products; use of swill, garbage, and food processing wastes for animal feed; salvage of automobile bodies and scrap metal; and the reclamation of miscellaneous industrial wastes.

Salvage and reclamation cannot be considered exclusively as a means of disposal but is usually a part of another disposal process. Many of the disposal sites in the state salvage metals and other materials with varying degrees of organization. One commercial salvage company operates magnetic separators at several controlled landfill sites to remove tin cans. Many tons of cans are salvaged and reclaimed for use in the copper industry. A large amount of waste paper and cardboard amounting to many thousands of tons per year are salvaged and processed through centralized baling stations. In some cases paper is also salvaged at disposal sites.

6. OCEAN DISPOSAL

Disposal of municipal refuse at sea is generally not an approved method of disposal. Even though such wastes may be barged considerable distance from shore, eventual return of flotsam to beaches and shorelines has not been satisfactorily controlled. Ocean disposal of municipal refuse, while practiced by some San Francisco Bay Area cities in the Thirties, has completely disappeared. This may be attributed to high cost, threat of water pollution, and loss of recreational use of coastal areas.

Presently, only some special wastes are hauled to sea. Food processing wastes from Oakland area canneries amounting to about 20,000 tons per year are currently barged out and disposed of in the ocean primarily because of a lack of suitable disposal facilities on land. This method, while expensive, appears to be satisfactory in that no large solids or other materials have been found to return to the shore.

Garbage from ocean vessels in the Long Beach-Los Angeles harbor area is hauled to sea for disposal as provided for in the California Agricultural Code. Approximately 1,000 tons per year are handled in this manner from nonmilitary sources. A report on the Naval facilities at San Diego indicates that military sources in this area were disposing of about 4,700 tons of garbage per year at sea.

In addition to the vessel garbage, chemical wastes (especially cyanide), classified parts, acids, and confiscated materials amounting to approximately 3,000 tons were disposed of at sea by ocean disposal firms operating out of the Los Angeles harbor during 1967.

Digested sewage sludge is disposed of to the ocean through outfall lines in many locations along the California coast and in San Francisco Bay.

7. OPEN BURNING

A considerable amount of solid waste is disposed of annually through open burning. This is the primary means for disposal of agricultural wastes such as orchard prunings, wheat and rice stubble, and brush and tree trimmings.

In those counties not included in air pollution control districts, open burning is extensively practiced at disposal sites. While some counties have banned burning at disposal sites, there are cities within the county that still operate open burning sites. Agricultural operations are also frequently exempt from burning regulations.

Special wastes such as tires and automobiles are frequently burned because of the difficulty in handling these materials or as a means of salvage. In the case of tires, the rubber is sometimes burned off and the metal threads inside are salvaged. Automobiles are burned to remove the upholstery and paint finish in preparation for reuse as steel. Open burning of these wastes and others create heavy atmospheric pollutant loadings.

8. PYROLYSIS

Pyrolysis is defined as the chemical change brought about by the action of heat. It is a process of destructive distillation carried out in a closed retort in an atmosphere either completely, or almost completely, devoid of oxygen. This process is used to make charcoal. It is also applied commercially to wood for the recovery of such organic by-products as methanol, acetic acid and turpentine.

Similar to incineration and composting, pyrolysis cannot be considered an ultimate disposal method inasmuch as the inorganic material must be disposed of by other means.

This process has generally been in the development stage and not utilized for total municipal refuse disposal. There are few installations in California known to have functioned on solid waste materials. The U.S. Navy Concord Weapons Station disposed of dunnage at a two-ton-per-hour private plant for approximately two years. Peach pits are currently converted to charcoal near Milpitas.

9. ANIMAL FEEDING

The amount of garbage and swill being fed to hogs has greatly decreased in recent years due to stringent regulations regarding the cooking of garbage, specifically the State Department of Agriculture regulation requiring the cooking of mixed garbage at 212°F for 30 minutes. Approximately 24,800 tons of cooked garbage and swill were disposed of through this method in California. In addition, more than 14,000 tons of uncooked material such as market greens, bakery wastes and candy are fed yearly. During the food processing season, many ranchers also feed culls.

Culled fruit and vegetables are also fed to cattle. In this method the food processing wastes are spread on fields and cattle are allowed to graze on these materials.

10. DISPOSAL ON FIELDS

Agricultural manures and some cannery wastes are often disposed of by spreading on agricultural fields and eventually plowing into the soil. In some cases of food processing wastes, animals are allowed to feed on the wastes when first deposited. This practice unfortunately has led to some severe insect, rodent, and odor problems as well as pollution of some streams. The objective of this method is to spread these wastes thin enough to permit rapid drying or removal of moisture.

C. EVALUATION OF DISPOSAL SITES

Land disposal of solid wastes is by far the most prevalent means of disposal in California. As indicated earlier in this report, a considerable portion of the field survey involved an evaluation of each solid waste disposal site in the state. The results of that survey are presented in the following sections.

1. CLASSIFICATION OF DISPOSAL SITES

It was necessary at the start of the field survey to determine which disposal sites were significant enough to warrant evaluation. To attempt to obtain information on illegal dumps, individual sites serving only a few homes, roadside litter locations, etc., would be impractical and time consuming. All landfill sites in California, therefore, were determined to be either "general use" sites or "supplemental" sites. General use sites are sites which receive wastes from the general public and collection agencies, and receive a variety of wastes. These are the "official" or "authorized" sites which are recognized by the local agencies as designated disposal areas.

The very small or single use sites were classified as supplemental disposal sites. These sites include disposal areas at city corporation yards, street sweeping dumps, single user solid fill areas, military sites, and disposal sites serving the property owner only, such as a ranch or industrial facility. These sites are usually not recognized or regulated by local agencies as official sites. While some information was obtained on supplemental sites, this information is incomplete and inconclusive and was not included in this report. It is estimated that approximately 500 of these sites may exist in California in addition to the 716 general use sites.

Each general use site in California was inspected, evaluated and pertinent information was obtained. The data presented in this report are based on this information.

All general use sites were rated according to their type of disposal operation. Two uncontrolled disposal classifications (generally referred to as dumps) and three controlled operation classifications (referred to as controlled landfills) were utilized. The definitions of these classifications follows as well as photographs depicting typical examples of each type.

a. Uncontrolled Burning Dump - UBD

The uncontrolled burning dump is an open dump and the lowest classifica-

UNCONTROLLED
BURNING
DUMPS
(UBD)

Wastes scattered over large area.

Wastes dumped over embankment.

Unloading area obscured by smoke.

tion used in the survey. It is generally considered to be an unacceptable type of operation from a health and safety viewpoint. Characteristics of these sites include little or no supervision, little or no maintenance and numerous environmental and public health problems, such as smoke, odor, flies, rodents, and the improper disposal of hazardous materials such as pesticide containers.

b. Supervised Dump with Burning - SDB

A supervised dump with burning is an open dump at which dumping operations are supervised by a site caretaker. The appearance of the site and the control of dumping operations are better than that of an uncontrolled burning dump; however, similar environmental problems are present.

c. Modified Sanitary Landfill with Controlled Burning - MSLB

A modified sanitary landfill with controlled burning is a much superior type of operation than an open dump. Burning of garbage is not allowed at this type of site and controlled burning is limited to brush and other cellulose material. These sites have a routine program of periodically compacting and covering the solid wastes with suitable cover material. A MSLB usually has fewer environmental problems than either of the open dump types depending on the frequency of cover.

d. Modified Sanitary Landfill - MSL

A modified sanitary landfill is similar to a MSLB, only burning is not allowed. Refuse material is covered periodically but not necessarily at daily intervals.

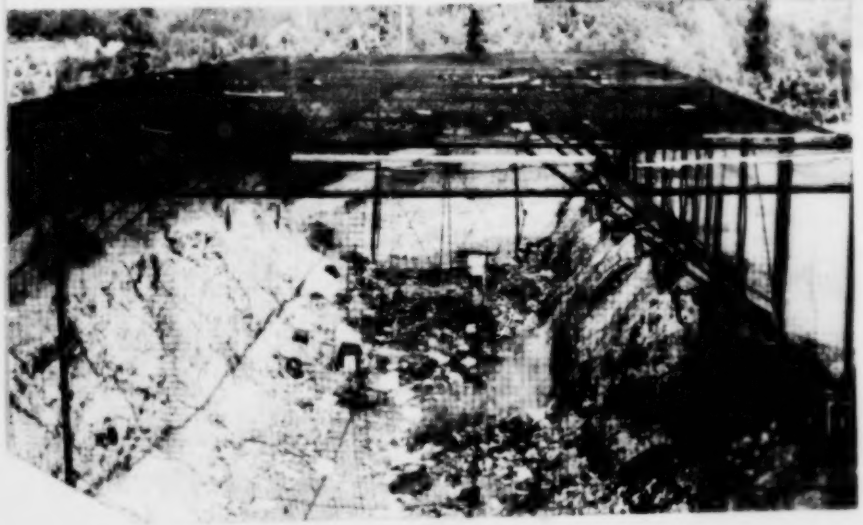
e. Sanitary Landfill - SL

A sanitary landfill is the ideal classification of landfilling. The most essential operational feature of a sanitary landfill is adequate covering

SUPERVISED DUMP WITH BURNING (SDB)

Dumping into a trench or over an embankment.

ote appearance of some control.



Special attempt to control blowing material before and during burning.

MODIFIED SANITARY LANDFILLS

(MSL)

Sides of trench and elevated mound covered completely -- working face remains open.

Exposed wastes covered periodically.

of the refuse. At a sanitary landfill, a uniform compacted layer of suitable cover material must be placed over all exposed solid wastes by the end of each working day; complete daily covering of the fill must be provided. Other important operational details are compaction, total absence of burning, minimum-sized working face, and an overall neat appearance. Environmental and public health problems are absent or controlled.

f. Other

Grouped into this classification are special landfill sites which receive only relatively inert material such as nondecomposable demolition debris and concrete ("solid fill sites"). These sites usually do not require the same operational criteria as sites receiving readily decomposable organic materials.

2. CAPACITIES OF DISPOSAL SITES

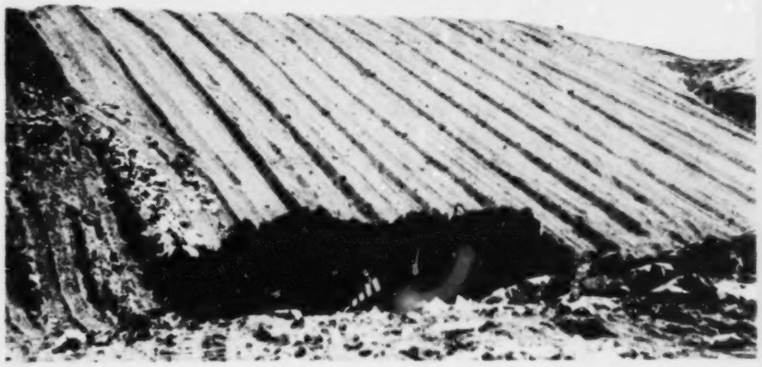
The location of all of the general use sites in California is shown on maps in Appendix D. Tables accompanying each map indicate the type of operation and other pertinent information for each site. Table VI-1 below shows the statewide summary of the number, the total area, and total daily tonnage received for each classification of disposal site. It should be noted that material received is weighed at only 32 disposal sites and, including those sites, only 117 site operators keep any kind of quantitative records. The material received (daily tonnage) at the remaining 599 disposal sites was, therefore, estimated as closely as possible.

The total land area devoted to solid waste disposal sites in California at the present time is approximately 56 square miles. As can be seen in Table VI-1, there are 511 dumps (72 percent of the total sites) which utilize burning as the primary means of handling the waste. These same 511 sites have a total area of 12,320 acres or 35 percent of the land in current use

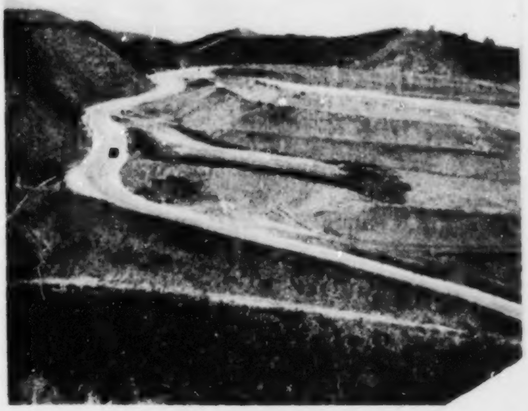
SANITARY
LANDFILLS
(SL)

Wastes deposited in small canyon. Daily cover material obtained from sides of canyon.

Trench constructed ahead of active face -- all wastes covered daily.



Wastes deposited at bottom of slope and spread upward. Face completely covered daily.



Large canyons filled with wastes and final grade contoured for future use.

for solid waste disposal. The amount of wastes received daily at these sites is quite small, amounting to almost 3,200 tons or only 6 percent of the statewide total. It is quite significant that 72 percent of the disposal sites in the state are burning dumps which in turn only dispose of 6 percent of the total refuse. The proliferation of this type of operation and the low quantity of wastes handled are due principally to the extensive use of these small sites in rural areas. These burning dumps (UBD and SDB) may be found in 51 of the 58 counties of the state.

TABLE VI-1

STATEWIDE SUMMARY OF TYPES OF SITES

Type of Site	No. of Sites	Area In Site (acres)	Daily Wastes Received (tons)	Number of Counties Using This Type Site
Uncontrolled Burning Dump	377	6,620	1,080	48
Supervised Dump With Burning	134	5,700	2,080	37
Modified Sanitary Landfill With Controlled Burning	29	2,384	1,250	18
Modified Sanitary Landfill	96	10,752	14,290	24
Sanitary Landfill	67	9,755	33,490	16
Other	13	406	1,280	5
Totals	716	35,617	53,470	

In contrast, there are only 67 or 9 percent of the total sites in the state classed as a sanitary landfill (SL), the most acceptable form of landfill disposal. These are generally large sites as reflected by a total land area of 9,755 acres or 27 percent of the statewide total; they receive about 33,500 tons per day of wastes or 63 percent of the total. It is interesting to note that 27 of the 67 sanitary landfill sites are located in Los Angeles

County. Disposal sites in Los Angeles County dispose of 48 percent of the total quantity of wastes handled by all disposal sites in California.

More acreage (13,136 acres; 37 percent) is in use as modified sanitary landfills (MSL and MSLB) than any other type of disposal site although only 17 percent of the number of sites are of this type. This type of operation handles 29 percent of the total wastes received at disposal sites. Exclusive of Los Angeles County, this type of site receives 51 percent of the wastes of the other 57 counties.

The type of operation designated as "other" was used limitedly in the survey. This low number was caused by the fact that many disposal sites locally regarded to be very restrictive in the type of wastes received (such as solid fill only), were found to actually receive other types of wastes, therefore, causing the site to fall under the MSL classification. This acceptance of the other wastes is due to the lack of control of materials received because of limited supervision and the tendency for loads to be composed of mixed wastes. Additional sites were found to handle insignificant volumes of material and, therefore, were considered as supplemental disposal sites.

An effort was made to determine the capacity of each general use site. In the absence of definitive operational plans (such as the contemplated final depth of fill), estimates were required at many sites. An estimate was also made of the number of years the site could continue to receive wastes (life expectancy) based on the existing operational procedure. It was impossible to determine the capacity of a few disposal sites. These were primarily those small sites where solid wastes are dumped over the rim of a large canyon or into flowing water. In a few sites, the potential capacity extended the related life expectancy beyond the period of time the land would be available (such as the term of lease). In this case, the lesser time was assumed.

Table VI-2 shows the cumulative capacity of the sites within each county

TABLE VI-2

DISPOSAL SITE CAPACITY AND LIFE EXPECTANCY

County	Total Number of Sites	Total Capacity of Sites		Life Expectancy No. of Sites			
		Acre Feet	Sites Unknown	0-5 Years	6-10 Years	11-20 Years	>20 Years
Alameda	11	24,350	0	4	3	0	4
Alpine	2	170	0	1	1	0	0
Amador	6	100	1	1	2	0	3
Butte	12	1,320	4	4	4	0	4
Calaveras	8	390	0	1	1	4	2
Colusa	7	200	0	5	2	0	0
Contra Costa	4	48,000	0	1	0	1	2
Del Norte	4	1,200	0	0	1	3	0
El Dorado	15	3,020	1	2	2	4	7
Fresno	27	10,050	4	15	1	2	9
Glenn	6	320	1	2	0	0	4
Humboldt	20	1,180	7	5	1	1	13
Imperial	16	5,630	0	2	1	3	10
Inyo	17	2,720	0	3	1	1	12
Kern	37	13,120	0	7	5	3	22
Kings	5	500	1	1	1	0	3
Lake	7	2,800	0	0	1	1	5
Lassen	15	520	1	0	6	4	5
Los Angeles	39	158,000	1	13	10	9	7
Madera	7	1,580	0	1	0	2	4
Marin	3	8,500	0	1	0	0	2
Mariposa	7	520	0	1	3	2	1
Mendocino	14	2,650	1	5	1	3	5
Merced	13	2,320	0	1	0	2	10
Modoc	12	1,650	0	0	1	2	9
Mono	18	380	0	6	4	2	6
Monterey	13	28,890	1	0	1	2	10
Napa	5	5,780	0	0	2	1	2
Nevada	5	300	3	0	0	0	5
Orange	10	42,060	0	2	5	3	0
Placer	14	2,920	0	4	1	2	7
Plumas	13	740	2	3	2	3	5
Riverside	27	103,770	4	7	6	4	10
Sacramento	9	66,950	0	3	2	0	4
San Benito	4	700	0	1	0	0	3
San Bernardino	34	56,170	0	5	4	7	18
San Diego	23	18,220	0	6	4	1	12
San Francisco	4	870	0	3	0	1	0
San Joaquin	6	15,780	0	2	0	3	1
San Luis Obispo	14	6,430	0	6	2	4	2
San Mateo	13	6,000	1	8	1	2	2
Santa Barbara	6	17,870	0	1	4	0	1
Santa Clara	17	16,020	0	8	2	3	4
Santa Cruz	6	3,310	0	1	0	2	3
Shasta	18	4,980	1	2	6	0	10
Sierra	6	20	4	0	0	0	6
Siskiyou	27	1,300	1	10	7	5	5
Solano	7	3,750	0	2	1	2	2
Sonoma	9	2,000	0	6	1	0	2
Stanislaus	7	1,000	1	4	2	0	1
Sutter	1	10	0	0	1	0	0
Tehama	8	4,690	0	3	2	3	0
Trinity	16	650	2	5	4	4	3
Tulare	28	8,040	1	6	6	5	11
Tuolumne	11	930	2	[illegible]	1	4	4
Ventura	7	2,590	0	4	0	0	3
Yolo	9	2,120	0	1	0	1	7
Yuba	7	2,750	2	4	0	0	3
Totals		718,800	46	191	119	111	295

and the ranges of life remaining for the disposal sites. The total remaining capacity of all the existing sites in the state was found to be 718,800 acre feet. This might be visualized as 25 square miles, approximately 45 feet deep. Approximately 54 percent of this capacity is found in just 16 sites (in other words, 2 percent of the sites contain 54 percent of the capacity). As would be anticipated, the larger counties tend to have the larger disposal site capacities, but these capacities are generally being used at a more rapid rate.

While the existing capacity at first appears large, the most frequent need expressed by public officials during survey interviews was the need for more disposal sites. This need is evident from the data in Table VI-3. It is significant to note that approximately 27 percent of the existing disposal sites will be filled within the next five years under present operating conditions and 76 percent of these have no replacement planned.

TABLE VI-3

REMAINING SITE LIFE AND PLANNED REPLACEMENT

Status	Life Expectancy - No. of Sites			
	0 - 5 Years	6 - 10 Years	11 - 20 Years	20 Years
Replacement Site Planned	45	17	11	13
Sites With No Planned Replacement	146	102	100	282
Totals	191	119	111	295

The assumption was made when computing site capacities that existing operating conditions will continue in the future; this is subject to considerable doubt. Open burning at disposal sites is coming under more criticism each year and if burning is banned, more than half the sites in the state would probably find themselves with less than five years of life remaining. More stringent fire control regulations, water pollution prevention, and analysis of the use of federal lands are also currently threatening the continued use of many sites statewide. The nine counties indicated in Table VI-2 as having no sites with less than five years of life remaining will not continue in this unique circumstance with the growing pressures for improved environmental conditions.

The capacity of a disposal site is also directly affected by the degree of compaction of the solid wastes. Good compaction increases the quantity of wastes which can be disposed of in the site and reduces the future settlement of the completed project. At 483 disposal sites no compaction is provided. These sites are composed prodominantly of dumps (UBD and SBD). Only at 118 sites was the degree of compaction considered to be adequate; for example, sites where the solid wastes were spread in thin layers and compacted using large-sized tractors or special compaction machines.

3. OPERATION OF DISPOSAL SITES

One of the principal disadvantages of landfill disposal is the fact that suitable land is becoming increasingly more difficult to locate and acquire. The announcement of a proposed location of a new disposal site invariably results in a great public outcry and complaint against the location. This is principally due to the public attitude that disposal operations are poor neighbors; a belief that may be well founded based on some of the crude methods currently in use. The public has not been made aware that there is a difference between a dump and a sanitary landfill; in fact, many times they have been solid the latter only to receive another dump.

Most of the existing sites in California are located in relatively undeveloped areas. In view of the type of operations generally found throughout the state, the need for this isolation is quite obvious. Good sanitary landfills can, however, be operated close to populated areas. This has been well demonstrated in the Los Angeles area and in a few other scattered locations where landfills are operated without nuisance in residential areas.

Table VI-4 summarizes the various types of land usage found adjacent to existing disposal sites.

TABLE VI-4

LAND USE ADJACENT TO DISPOSAL SITES

Type of Site	Number of Sites by Adjacent Land Use						
	Total Number	Residential	Commercial	Industrial	Agricultural	Undeveloped	Other Use
Uncontrolled Burning Dump (UBD)	377	5	0	10	71	289	2
Supervised Dump with Burning (SDB)	134	3	0	3	53	73	2
Modified Sanitary Landfill (MSLB) with Controlled Burning	29	2	0	3	12	12	0
Modified Sanitary Landfill (MSL)	96	11	4	15	25	38	4
Sanitary Landfill (SL)	67	7	0	11	16	30	3
Other	13	3	0	7	0	3	0
Totals	716	31	4	49	176	445	11

As indicated in the table, there appears to be a greater acceptance of the controlled landfill (SL and MSL) operations in developed areas. This enables the completed disposal sites to be more closely integrated into the overall community development. The need for isolation of a dump-type operation is illustrated by the fact that only four percent of the dumps are located in developed areas whereas 31 percent of the controlled landfills are in developed areas. Two of the "other use" sites are prison property and the remaining nine are existing recreational areas. It is only a matter of time until the state's growth will preclude the existing ability to deposit wastes out of sight without infringing on someone else's back yard. In some areas, time has already run out.

a. Owners and Operators of Disposal Sites

A number of different agencies operate disposal sites. County agencies are presently the major operator of disposal sites, currently operating 380 sites or 53 percent of the sites in California. Private refuse firms also operate a substantial portion (181 sites or 25 percent) of the disposal sites. Table VI-5 shows the number of disposal sites operated by the various agencies in the state.

The total column in Table VI-5 indicates the number of general use disposal sites operated by private firms and the various levels of governmental jurisdictions. The state and federal governments actually operate a large number of supplemental sites in addition to those shown. Those not included in the general use category are the supplemental disposal sites serving facilities such as highway maintenance stations, state and federal parks, military installations and campgrounds. When the use was by a state or federal agency exclusively, the site was categorized as a supplemental site. Where these sites were also used by local residents, such as occurs in some sites serving the federal campgrounds in the mountainous regions, they were included as general use disposal sites. For the most part, the federal sites listed are small operations intended for national forest use but also used by the general public in the area. The state operations listed in the table are generally restricted in use and serve large state institutions.

TABLE VI-5

TYPE OF SITE BY OPERATOR

Operator	Type of Site						Total Sites
	Uncontrolled Burning Dump	Supervised Dump with Burning	Modified Sanitary Landfill with Controlled Burning	Modified Sanitary Landfill	Sanitary Landfill	Other	
City	32	35	9	9	13	1	99
County	273	67	3	16	19	2	380
District	5	2	0	1	6	0	14
State	5	6	1	1	1	0	14
Federal	24	3	0	1	0	0	28
Private	38	21	16	68	28	10	181

Disposal sites are operated by county agencies in 45 of the 58 counties. A significant observation is that 90 percent of the county-operated sites are open burning dumps. The reasons for this kind of operation need to be considered because they constitute a major problem in California. Most of these county-operated sites are located in sparsely populated rural areas. In these areas there is insufficient volume of refuse to economically justify a sanitary landfill operation. Private firms are generally unavailable or uninterested, therefore, the burden of providing disposal sites for these small communities falls upon the county. To prevent illegal dumping, many rural counties find it necessary to provide a great number of small dumps. Siskiyou County, for example, has 27 disposal sites for 35,300 people; whereas, Orange County has ten sites for 1,291,000 people.

In most counties the sites are operated by either the public works or the road department. Site operation usually is assigned to these agencies with the justification that they are familiar with the equipment. In two counties (San Bernardino and Santa Barbara), special departments have been established to manage the disposal programs. Many of the larger counties with public works departments have assigned the disposal program to a special division. Where the operating agency has dual responsibility or shares equipment with other functions, the disposal operation almost always comes out second-best. Operation by the administrative group refers to immediate direction by the board of supervisors as opposed to having a full-time employee responsible. This kind of operation is usually conducted on a constituent complaint basis which has obvious drawbacks.

Only nine of the counties with publicly-operated disposal sites levy user charges at the sites and five of these charge at all sites. It is, of course, impossible to levy a charge at the unattended sites. There are divergent opinions on the merits and consequences of charging at sites. The most common concern is an increase in roadside litter. Those agencies who have made the switch indicate that their fears were far greater than fact. In a few cases, a franchise for disposal site operation has been let out for bid. In these cases the county generally retains control of the land and the right to review and establish rates for use of the facility.

Table VI-5 indicated that there are 99 city-operated sites. City agencies operate disposal sites in 94 cities with three cities operating more than one site. Approximately one-half of the cities in the 2,500 to 10,000 population range operate their own disposal site. This group accounts for slightly more than one-half of all the city-operated sites. Almost all city-operated sites are run by the public works department.

There are 15 disposal sites operated by districts in the state. The five sites operated by the Los Angeles County Sanitation Districts are among the largest disposal sites in the state (based on tonnage received). Of the ten garbage disposal districts, only one district (Cambria) actually operates a disposal site. Only two garbage and refuse disposal districts exist in the state; they include the Monterey Peninsula Garbage and Refuse Disposal District which includes six cities and a portion of the unincorporated Monterey peninsula area, and the South County Garbage and Refuse Disposal District which includes five cities and certain unincorporated areas in southern San Mateo County. Districts whose primary function is waste disposal have better quality operations than the other local jurisdictions who are maintaining sites primarily because they have equipment.

Privately-operated disposal sites are generally found in areas where disposal operations are profitable or where there is sufficient population to support collection services. Some private disposal sites are not operated as a matter of choice, but rather as a required condition to obtaining the franchise for collection service. This relieves the city or county of the responsibility of providing a disposal service. In these arrangements the amount of reimbursement to the private operator varies. The city or county may or may not furnish the land and rarely provides funds. The site operation is then financed by user and collection charges. If the site is to be open to the public without charge, the entire cost of the site operation is paid out of the revenue from collection service fees.

As would be expected, many of the privately-operated sites have user fees (117 of the 181). Those that do not charge are in the following categories: (1) sites used exclusively by the collector; (2) publicly-owned sites operated by private collectors as part of the franchise agreement; or (3) burning operations.

Ownership of disposal sites is quite varied. Private ownership accounts for 231 sites (32 percent) and the remaining 485 sites (68 percent) are in public ownership. Public agencies lease 97 of the privately-owned sites for publicly-operated disposal sites. A breakdown of the public ownership is as follows:

City	118
County	198
District	9
State	18
Federal	142
Total Public	485

The large amount of federally-owned sites (20 percent of total sites) is due to public agencies using lands of the U.S. Forest Service and Bureau of Land Management. Both of these federal agencies have land-use permit procedures which recognize the use of lands for waste disposal. These agencies are becoming more concerned about the type of operation used for disposal and are placing more restrictions on their use (especially no burning). Some administrators of national forests feel the fire hazard is too great to have accumulations of refuse and, hence, do not allow any disposal sites.

The Bureau of Land Management is a source for public agencies to buy land inexpensively for use as a disposal sites. Restrictions are placed on what the ultimate use of the land must be (recreation, etc.), but the land may be filled with refuse prior to the final use. Land may also be leased from this agency.

The following list summarizes the public and private involvement in ownership and operation of disposal sites in California:

Owner	Operator	Number of Sites
Public	Public	438
Public	Private	47
Private	Public	97
Private	Private	134

b. Cost of Operating

An attempt was made to collect operational cost data during the survey. This information was found difficult to obtain. The details and methods of budgeting and maintaining operational records vary considerably between agencies. Private operators often would not disclose this information since they considered it confidential. As a consequence, this information is incomplete and generalization of the gathered data has been necessary.

Operational cost (exclusive of land cost) exceeds 15 million dollars per year for the controlled disposal operations (SL, MSL and MSLB type sites) which constitute 29 percent of all the general use sites. The remaining 71 percent of the general use sites, which use open burning as the principal method of disposal, spend approximately 1 million dollars annually for operation. Unaccountable loss through defacing the land and reducing its usefulness, plus damages to the surrounding properties, frequently accompany the latter operations. Millions of additional dollars are spent yearly by industry, governmental agencies and private individuals on sites categorized as supplemental sites.

It must be remembered that the previous figures represent only disposal cost, exclusive of land, and that collection and haul costs are also additional. The total estimated cost for collection and disposal of the 19.5 million tons of solid wastes handled at the general use sites is approximately 300 million dollars per year.

The solid waste disposal industry in California employs the equivalent of 1,100 men at general use disposal sites. Approximately 6,100 man-hours are utilized at the sites on an average day. These figures represent only the man power utilized in operation of the site. The use of this man power per site is a function of the volume of wastes handled at the site; the larger the site, the more man-hours required. Usually, no more than two men are involved in the operation of supervised dumps with burning; the controlled landfills require more employees. In fact, sanitary landfills which comprise nine percent of the sites by number employ 38 percent of the man power in this industry.

Almost all controlled disposal sites have limited hours during which refuse is received. Only two sanitary landfills and 12 modified sanitary landfills are open greater than 16 hours per day. Seventy-nine percent are open six days per week and six percent are open five days or less per week.

Ninety percent of the general use disposal sites (642 sites) are open for use by the general public; at 40 percent of the sites, they are the only contributor. The latter group of sites include primarily the small rural sites where there is no collection service.

As suggested throughout this chapter, records in the field of solid wastes are sparse and nonstandard. During the survey it was found that operational records were maintained on less than one-third of the sites in use and only one-sixth of the sites maintain quantitative records. Frequently, the county operations charge all disposal work to a single fund code and, hence, the detail for individual sites is lost. Under this system it is impossible to determine actual cost, logical maintenance, and needed improvements.

c. Materials Excluded From Sites

A common item at many disposal sites is a sign denoting the types of wastes which are prohibited from disposal in the site. These regulations are usually local rules, sometimes required by the county or city ordinance. In some areas of the state the Regional Water Quality Control Boards have established discharge requirements for sites which preclude the acceptance of liquid or hazardous wastes that would impair water quality. Table VI-6 indicates the restriction of various solid wastes in controlled and uncontrolled disposal sites. At the controlled landfills (SL, MSL, and MSLB; 192 sites) there usually are sufficient equipment and personnel to handle all types of wastes received. Open burning dumps (UBD and SDB; 511 sites) usually do not have equipment available to handle the wastes received and, of course, the unattended sites do not have any effective method of excluding specific types of wastes.

TABLE VI-6

NUMBER OF SITES EXCLUDING SPECIFIC TYPES OF WASTES

Wastes Excluded	Controlled Sites (SL,MSL,MSLB)	Uncontrolled Sites (UBD,SDB)
Garbage	35	39
Industrial Wastes	25	25
Sewage Treatment Residue	84	190
Agricultural Wastes	19	34
Demolition Wastes	22	37
Abandoned Vehicles	93	122
Liquid Wastes	64	63
Dead Animals	77	238
Tires	14	5

As can be seen, sewage treatment residue, dead animals, and abandoned vehicles are the items most commonly excluded. The exclusion of garbage is a difficult item to control and rarely is it completely effective. Those sites which are attempting to exclude garbage and be "rubbish dumps" only are still faced with numerous environmental problems. The 13 sites classified as "other" type operations usually exclude all of the above items except demolition materials.

Many types of solid wastes present hazards to health and safety and, therefore, dictate the need for safe and proper disposal. Examples of hazardous materials include toxic chemicals from industrial and agricultural operations, dead animals, septic tank sludges and pesticide containers. Past problems experienced with these types of materials include the detonation of explosives, contact with bacteriologically contaminated wastes, and a civil defense evacuation alert resulting from the burning of discarded chlorine capsules at a disposal site. In this survey an attempt was made to determine what provisions have been made at disposal sites for handling hazardous or special wastes. In essence, provisions should be made to handle these materials at almost all sites. The results of the survey are limited to the observance of hazardous type wastes in the site at the time they were visited. These materials were noted at 64 sites where handling provisions were considered to be needed. Only 42 disposal sites were considered to have effective handling of these materials.

The severity of problems encountered in the handling and disposal of abandoned automobiles varies between areas. The large urban areas produce the major numbers of these vehicles, but these areas also possess the industrial facilities (the automobile dismantlers, the scrap yards, the metal reclamation firms) to handle this solid waste. Probably the most critical conditions occur in the less populated, remotely located counties. Although these sources produce lower numbers of abandoned vehicles, the limited salvage value of this waste and the extreme distances to salvage facilities cause these vehicles to accumulate. These vehicles are, therefore, left in the back yard or along roadsides creating safety hazards to children and a blight on the landscape. If they are deposited in disposal sites, they become an operational problem since it is these same counties that do not have equipment capable of properly handling them. Several counties have established special disposal areas for these vehicles or require that the vehicles be cut into several pieces before disposal in the county sites.

d. Equipment Used At Sites

The most common piece of equipment found at a landfill is a track-type tractor with a bulldozer blade. This machine is used to compact and spread cover material. The size of the tractor is related to the volume of material handled at the site; at large disposal sites several tractors may be used. The track-type tractor is able to crush and compact most types of solid wastes from cardboard boxes and wood crates to discarded washing machines and automobiles. For optimum compaction, wastes should be spread in layers and compacted by repeated passes of the tractor. An adequate number of tractors should be provided to maintain the size of the active face. The equipment must be able to spread and compact as rapidly as the rate at which material is received. If cover material is located nearby, this material may be moved and spread by the tractor. In sites where the cover material must be hauled long distances (generally over 500 feet), a scraper-type earth-moving machine may be used.

At small sites where the capital investment in equipment is limited, a loader-type machine is often used. This machine can compact, carry cover material short distances and spread the cover material. At disposal sites using trenches, often this trench is excavated under a separate contract using outside equipment. In this manner sufficient volume is provided for six months to one year of operation.

Draglines are used at 37 disposal sites in the state. This machine is used commonly in marshland sites. As the fill progresses forward across the marsh, the dragline is used to excavate mud from the front of the fill for use as cover material.

Lately, specialized compaction machines have been given increased attention. These machines, equipped with steel wheels, weigh up to 60 tons. Like the track-type tractor, the compaction machines spread refuse and then compact it during repeat passes over the fill. These machines are designed to achieve high pressures under the wheels and operate at more rapid speeds than a tractor. Generally, they are used most efficiently in conjunction with a track-type tractor in only the very large sites.

Other types of equipment include water trucks for dust and fire control and motor graders for road maintenance.

VII. ENVIRONMENTAL EFFECTS OF SOLID WASTES

A fundamental reason for concern about solid wastes is the threat that they impose on the health and well-being of the public and the role that they may play in the spread of communicable diseases. A report recently published by the U.S. Public Health Service[1] on the relationships of solid wastes to disease transmission supports the contention that there are definite, if not well defined, etiologic implications with a number of infectious diseases.

The most prominent health factor associated with solid wastes is domestic flies. Flies are carriers of many disease agents and evidence exists that they are significant vectors of shigellosis and other enteric infections. The demonstrated ability of flies to propagate in enormous numbers in organic wastes, to contaminate themselves in fecal material, and ultimately to contaminate man or his environment, clearly incriminate the fly as a health hazard. Thus, the wastes in which flies develop or in which they become contaminated constitute the primary hazard. The fly is an indicator of a breakdown in basic sanitation when present in a community.

Other disease vectors whose populations are enhanced by the presence of solid wastes include rats, cockroaches, and mosquitoes. Their numbers may become excessive and spill over into suburban and urban areas in situations where inadequate solid waste storage and disposal methods are employed. The threat of plague, a disease enzootic in certain of California's sylvatic rodent populations, is increased by poor solid waste management.

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[1] U.S. Public Health Service, Solid Waste/Disease Relationships, by T. G. Hanks, M.D., (Cincinnati, 1967).

While control of communicable disease is of paramount importance, it is more meaningful in discussing the problem of solid wastes to take a broad view of the term "public health". No longer can we restrict attention only to the factors involved in the spread of communicable diseases. Of equal importance is the broad and pressing public interest in all factors of environmental health including the aspects of comfort, enjoyment of life, and the general physical and mental well-being of the public. On the basis of this broader outlook, there are many points of public health concern which relate to the manner by which solid wastes adversely affect our land, air and water. In addition to the direct effect of solid wastes on the quality of these three elements, are the accompanying physiological or psychological effects on man. These may range from immediate danger, such as physical harm, to merely a less pleasant or comfortable environment, such as that which offends the five senses.

It is recognized that there are three forms of wastes: liquid, solid and gaseous. There are also three possible receptacles for these wastes: the air, the water and the land. Solid waste is perhaps unique in that it is the one waste which can directly affect all three elements.

Solid waste disposal as now practiced is a significant contributor to air pollution. Although burning of solid wastes is a traditional means of disposing of this material, this process merely transforms the nature of the material from solid to gaseous waste. Burning is frequently carried out in open dumps, fields, or by other inadequate methods which produce smoke, odors, unsightliness, and contribute to overall air pollution.

Another familiar practice in California is disposal of solid wastes into the ocean, bays, streams and ground waters. The leachate, gases and floating debris thus produced contribute to the degradation of ground and surface water quality. The grinding and discharge of solid wastes into sewers are adding to an already overburdened liquid waste conveyance and treatment system and to the loading on receiving waters.

The third element of our environment, the land resource, is suffering severely from "land pollution". The prevalence of open dumps, illegal littering, and indiscriminate deposition of solid wastes constitutes aesthetic eyesores while degrading adjacent property values.

When considering the effects of solid wastes on air, water, and land, and the relationships to disease transmission, it should be borne in mind that we are dealing with a highly complex ecosystem. The environment must, therefore, be considered as a whole in any meaningful evaluation of our ultimate responsibilities in the management of solid wastes.

A. EFFECTS ON HEALTH

1. PUBLIC HEALTH CONCERNS

a. Flies

As stated earlier, domestic flies are the most prominent factor associated with organic solid wastes. Flies pose a multiple threat to a community: (1) they are vectors of disease, (2) they threaten the cleanliness and wholesomeness of processed foods, and (3) they become intensely annoying pests. Any warm, moist, organic material is a potential source of fly breeding.

The ability of flies to quickly find suitable material on which to deposit their eggs is well known. The "garbage can" and storage area often play an important role in this phase of the fly's activity. The life cycle of these flies (Phaenicia spp.) is well adapted to the garbage can environment. The adult female enters the can and lays 50 to 200 eggs that hatch in about eight hours. The larvae (maggots) feed in the garbage for about five days, and then they crawl out of the garbage can and pupate in the ground. With once-a-week garbage collection, many larvae crawl out of the can before the garbage is removed.

In a study of 145 garbage cans conducted by the Department in Fresno[1] during the summer of 1967, the weekly median number of larvae that crawled out of the containers with once-a-week garbage collection was 262, and the weekly median for containers with twice-a-week collection was four. During the summer in Fresno, once-a-week collection is not frequent enough to prevent fly production. This is well demonstrated by one can, in good condition and kept clean by lining with newspaper, that produced 55,428 flies during the seven-week study.

Studies on fly production were also conducted by the Department in Santa Clara County,[2][3] Concord,[4] Pasadena,[5] Long Beach,[6] and Compton.[7] The results of these studies indicated: (1) the use of garbage grinders substantially reduces the number of flies produced in refuse containers; (2) fly larvae tend to migrate out of refuse cans in less than seven days even though the garbage may be wrapped and the cans clean: (3) twice-weekly collection to be effective in significantly reducing fly production; (4) no significant difference in fly production between covered and uncovered refuse cans.

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[1] J. D. Walsh, et al, "Fly Larval Migration From Residential Refuse Containers in the City of Fresno", California Vector Views, XV, No. 6 (June 1968).

[2] D. H. Ecke, et al, "Migration of Green Blow Fly Larvae From Six Refuse Container Systems", California Vector Views, XII, No. 8 (August 1965).

[3] D. H. Ecke and D. D. Linsdale, "Fly and Economic Evaluation of Urban Refuse Systems (Part 1)," California Vector Views, XIV, No. 4 (April 1967).

[4] E. Campbell and R. J. Black, "The Problem of Migration of Mature Fly Larvae From Refuse Containers and Its implication of the Frequency of Refuse Collection", California Vector Views, VII, No. 2 (February 1960).

[5] H. I. Magy and R. J. Black, "An Evaluation of the Migration of Fly Larvae From Garbage Cans in Pasadena", California Vector Views, IX, No. 11 (November 1962).

[6] California Department of Public Health, Fly Larval Migration From Residential Garbage Cans, City of Long Beach, by D. L. Rohe, et al (Berkeley, 1963).

[7] California Department of Public Health, An Evaluation of Fly Larval Migration From Containers of Combined Refuse in the City of Compton, California, by D. L. Rohe, et al (Berkeley, October 1964).

Even with adequate storage and collection, flies can still be produced if the final disposal of the refuse is not adequate. Most refuse, upon delivery to a disposal site, already contains many fly larvae which are ready to emerge as adult flies. Unless immediate measures are taken to prevent emergence, large numbers of adult flies will result. The only effective preventive measure now in use by communities in California is the disposal of solid wastes in a sanitary landfill. It is very important to compact the soil after covering a sanitary landfill. Emerging adult flies can crawl up through more than five feet of loose soil, but they cannot penetrate through six inches of compacted soil. Unfortunately the refuse from many communities is taken to a dump rather than to a sanitary landfill. Even if the wastes in the dump are burned every day, most of the fly larvae will not be killed because the wet garbage containing the larvae is not burned. The fire burns only the paper and garbage on the surface; therefore, when the ashes are removed from the surface, the larvae are exposed in the garbage.

The presence of large numbers of adult flies at a refuse disposal operation always indicates a sanitary deficiency. This problem becomes serious when the fly population pressure becomes so high that spillover to the surrounding area occurs. When this happens, flies leave their "source point" and go to an "attractant point" such as a residence, restaurant, or business. Flies have been reported to migrate as far as twenty miles from a source of production.

Several other sources of flies often exist in or near communities. Some of these are:

(1) Grass clippings which are placed in piles or containers for several weeks.

(2) Animal manure from stables, poultry ranches, feedlots, and dairies where the manure is not managed properly.

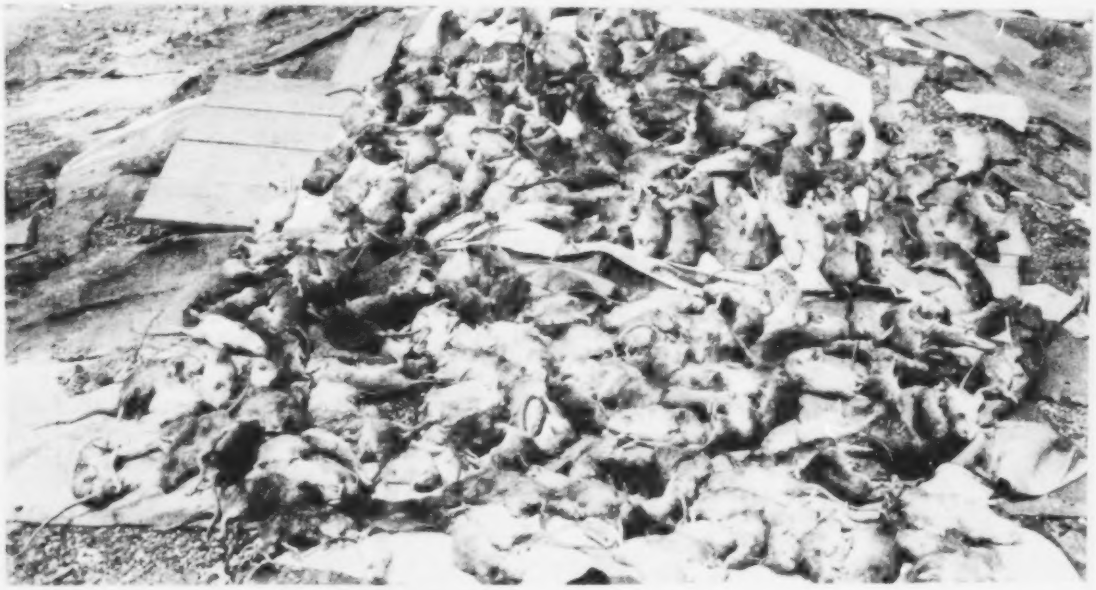
(3) Cull fruits and vegetables which are dumped in piles or improperly fed to livestock.

In order to obtain effective fly control, adequate management of solid wastes at their source is essential to prevent fly breeding. Consequently, fly control requires area-wide solid waste management from the standpoint of geography as well as types of wastes. Waste management systems that do not include the urban fringe and do not include all types of wastes that are capable of producing flies are not adequate.

b. Rodents

Solid wastes are one of the primary sources of support of domestic rodents in communities as well as in rural areas. In addition to rats and mice, several other species of small wild mammals are attracted to man's wastes. These include opossums, skunks, ground squirrels and cats. Rodents have certain basic environmental needs which are not usually as exacting as those for flies. Stated simply, the two requirements are food and shelter. Exposed refuse furnishes both on a lavish scale.

Improperly stored solid wastes provide an ideal food supply for domestic rodents and other small mammals. Improper storage of household garbage goes hand in hand with the presence of Norway rats in densely settled urban neighborhoods. The use of sturdy containers with tightly fitting lids goes far in



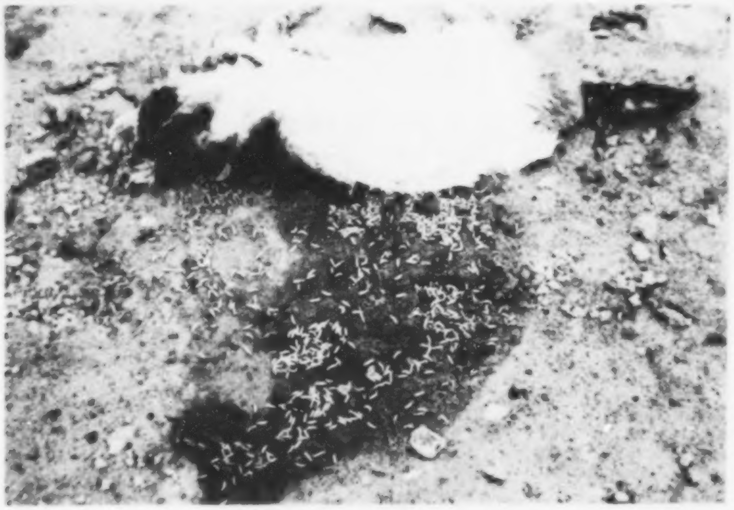
Result of rat poisoning program at open dump.

Scotch Treat

In garbage can.

White specks are fly larvae (maggots).

On open dump.



reducing the availability of garbage to rats and mice.

Open disposal sites (those in which the wastes are not covered daily with compacted soil) can provide food and harborage for large numbers of rats and mice. The population of rats on a disposal site sometimes runs into the thousands. These rodents are difficult to destroy with poison baits because of the abundant and varied food supply. Burning, even daily, does not eliminate animals from a disposal site. Daily covering with compacted soil does. Industrial and agricultural wastes attract and sustain rodent populations, too.

A disposal site may contain enough food and shelter to support a given rat population level. At certain times of the year, however, an excess of young animals is produced and in order to survive, some animals may move from the disposal site into adjacent areas. An example of this occurence was found in one northern California city where the city dump was located about one-quarter mile from a nearby residential area. Residents had for several years been periodically bothered by invading rats until the dump was closed and moved. With the site gone, so were the rats. A properly operated sanitary landfill would have prevented this situation.

A factor of major public health concern arises from the fact that a refuse dump affords a meeting place for field and domestic rodents. Field rodents, such as ground squirrels and chipmunks, are the primary reservoirs of bubonic plague (Pasteurella pestis) infection in this state. The refuse dump becomes important if it provides a point of transfer of infected fleas from wild to domestic rodents, thereby increasing the potential for human exposure within the urban population.

In addition to the hazard of infectious disease transmission, Norway rats attracted or sustained by solid wastes may attack infants or small children. While such attacks have been infrequent in California, rat-bite statistics, gathered from throughout the United States, indicate that as many as 14,000 persons are bitten annually.

Proper storage, collection and disposal of solid wastes can be a significant deterrent to the rodent population. The open, unmanaged dump often supports many rats, whereas the properly managed sanitary landfill will be free from rodents. For that matter, none of the accepted procedures for processing wastes, if properly designed and managed, should support or attract rats.

c. Occupational Health and Safety Hazards

Occupational health and safety hazards of refuse workers and the general public from solid waste management practices are not often thought to be of any serious nature. However, studies have revealed that refuse workers have an extremely high injury rate.[8] These studies show that the refuse collector has an injury rate twice as high as that for firemen and policemen. These occupational hazards include skin diseases, back ailments, hernia, muscle and tendon injuries and cardiovascular diseases.

Disposal operations also give rise to a high risk exposure among site operators and the public using these facilities. Open burning and unsupervised dumps are the setting for numerous safety hazards. Where there is open fire, burn injuries can be expected. Also, there have been various reports throughout the state of permanent eye damage and other injuries from explosions of aerosol and glass containers.

The physical layout of some disposal operations creates special safety hazards. Many sites are constructed in such a manner that an individual finds himself dumping over the side of a high embankment. In some cases there may be a precipice of several hundred feet. Barriers or stops have been installed in some sites; however, through use and wear, these safety guards in time become ineffective. At one such site a man was killed when he backed his car over the edge of the embankment. There have been other accounts of operators rolling their equipment over embankments or steep operating faces of disposal sites. These are ever-present dangers if care and attention to the operation is not taken.

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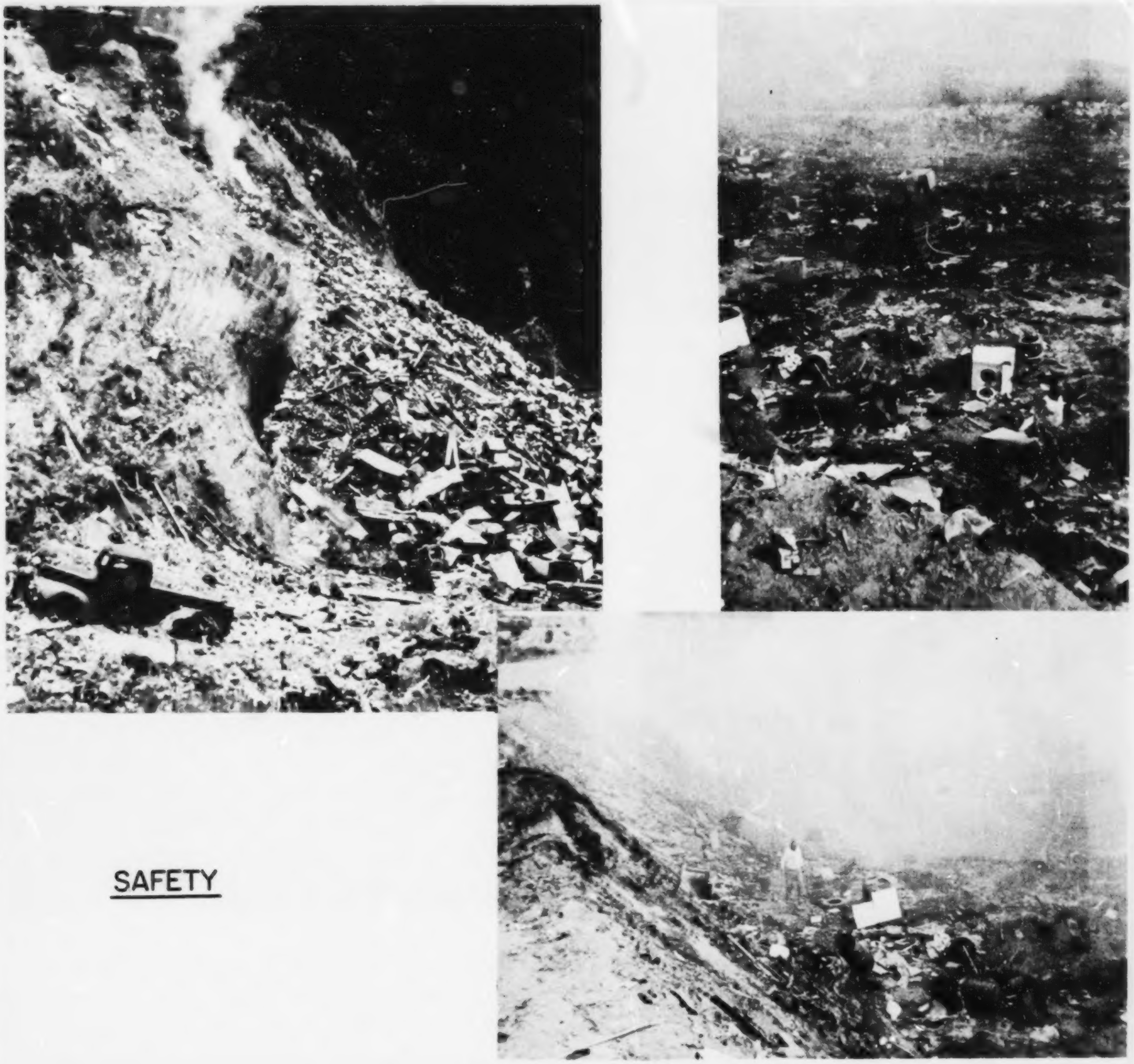
[8] D. P. E. Sliepcevich, The Effect of Work Conditions Upon the Health of Uniformed Sanitation Men of New York City, Doctoral Dissertation Series, Publication No. 20,008, University of Michigan, (Ann Arbor:University Microfilms, Inc., 1955).

Uncontrolled traffic creates still another potential safety hazard. If good traffic lanes are not established and equipment operation and vehicular traffic are not supervised, all types of encounters may occur.

Of the many kinds of wastes that are deposited at disposal sites, some, such as insecticides and other poisons, sewage sludges, and hospital wastes, are particularly hazardous. Hazardous pills, insecticide containers, infectious bandages, etc., can be found lying with such exposure that a person unaware of the hazards could easily pick the item up and remove it from the site. For example, there have been reports of children playing with syringes and needles retrieved from disposal sites. Allowing children access to a site at any time is extremely dangerous and should be prohibited. The exposure of refuse collectors to these hazardous wastes is a constant problem. In many cases these wastes are stored inadequately in open containers and in places where dogs, cats, and children could easily come in contact with them.

There are special public health problems associated with the handling and disposal of many industrial wastes because of their toxic nature. During 1966 this Department, together with the Contra Costa and Solano County Health Departments investigated an occupational and community health problem related to the reclaiming, transportation, and disposal of chemical sludge containing tetraethyl lead (TEL). In this case, the fumes from the waste not only caused



SAFETY

HAZARDS

HAZARDOUS WASTES FOUND IN DUMPS

Packages with small amounts of chemical remaining inside.

Offal from recently slaughtered animals.

Discharge of sewage pumpings.

Pesticide containers.

illness to the workers at the scene of reclamation, but allegedly caused chemical poisoning in an employee of another firm across the highway from the waste reclamation area. For some time the waste was being hauled across the Carquinez Bridge from Contra Costa to Solano County in open trucks, causing the bridge toll takers to become nauseated. At the disposal site eight dead cattle, which had been grazing near the site, were reported to have excess lead found in their livers.

Additional, infrequently encountered, special waste items may create special safety hazards if not properly handled. For example, one site in the state receives a large quantity of fibreglass wastes. As the tractor driver incorporates the wastes with other refuse, a glass dust is created causing severe skin rash to the operator. In another site, all the tractor operators find it necessary to wear dust masks because the soil in the area forms a fine dust particle that causes lung and skin irritations.

d. Public Nuisances

Collection and disposal of solid wastes present other features which are sometimes objectionable to the general public. Examples of these are early morning noise from collection operations; dust, dirt, and papers blown from the collection vehicle or the disposal site; odors; unsightliness of vehicles or sites; spillage of liquids or solids onto the street; and the convergence of large numbers of heavy vehicles to the disposal facility. All of these are offensive to the public and can be eliminated or minimized through good management practices.

2. SANITARY CONTROL AT EXISTING SITES

Disease potentials associated with flies and rodents, occupational health and safety hazards, and public nuisances at disposal facilities can best be minimized by an adequate program of daily covering and compaction with earth of suitable characteristics. This covering affords the following benefits:

a. Reduces attractiveness of the site to insects, rodents and birds by eliminating the food supply and shelter.

b. Prevents fly larvae in the incoming refuse from emerging as adult flies.

c. Eliminates prolonged exposure to hazardous materials.

d. Minimizes public nuisances.

For the proper protection, this cover material should be placed as rapidly as possible and no later than at the end of the day's operation.

Complete daily cover, unfortunately, is provided at only 85 (12 percent) of the general use disposal sites in the state. At 468 sites, no covering whatsoever is provided. The lack of standards and increased costs are given as reasons for the numerous sites deficient in this regard. The status of daily covering at California's disposal sites are shown in Table VII-1.

For covering to be truly effective, the enclosed solid wastes must be sealed in "cells" using an adequate volume of compacted earth material. Creating the cells through daily covering, including the working face of the fill, prevents animals from foraging on the wastes at night and restricts accidental fires to only one cell. In addition to controlling flies and rodents, covering also minimizes the blowing and scattering of paper, controls the production of odors, reduces fire hazards, reduces the attraction of birds, and improves the appearance of the disposal site.

Certain operations at a landfill site should receive special attention to provide assurance that the compaction and covering program will be effective. Adequate supervision must be provided to control access to the site, to direct dumping operations, and to supervise equipment operation. The size of the active open face of the disposal site should be kept to a minimum so as to be easily maintined with available equipment. Only 173 sites (24 percent) were considered to have minimum-sized working faces.

TABLE VII-1

STATUS OF DAILY COVERING BY TYPE OF SITE

Type of Site	Number of Sites				
	Complete Daily Cover	Daily Except Face	Every Other Day	Intermittently	No Routine Cover
Uncontrolled Burning Dump	0	0	0	21	357
Supervised Dump with Burning	0	0	0	29	105
Modified Sanitary Landfill with Controlled Burning	9	4	8	8	0
Modified Sanitary Landfill	9	27	22	37	0
Sanitary Landfill	67	0	0	0	0
Other	0	0	0	7	6
Totals	85	31	30	102	468

P. EFFECTS ON WATER

When solid waste residues of any type are ultimately disposed of to the soil, a potential for water quality impairment exists. Even if waste materials are burned, the ash will contain soluble substances which may dissolve in runoff and percolating water and, thereby, affect the quality of the adjacent surface water or underlying ground water.

Broadly considered, solid wastes may affect water quality through physical means, chemical and biological means, and gas production.

1. PHYSICAL IMPAIRMENT

Refuse dumped into streams and other surface waters results in conditions of poor aesthetic appearance and creates nuisances. Dumping over river banks and on flood plains is also an undesirable procedure since these materials may be washed into the river during periods of high water. In addition to creating unsightly conditions, these materials may litter the streambed and beaches; create hazards to swimmers, boaters and fishermen; and jam weirs on water diversions.

2. CHEMICAL AND BIOLOGICAL IMPAIRMENT

Analyses of waters that have been in contact with solid wastes such as refuse, have shown that both chemical and biological pollutants are present. These waters, generally termed leachate, occur when water percolates through solid wastes. The refu[illegible]n a disposal site (the fill) can be compared to a large sponge. Before leachate can emerge from a fill, the fill material must be saturated with water. The amount of leachate and its composition are dependent upon the material in the fill (organic or inorganic, soluble or insoluble), conditions in the fill (temperature, pH, moisture content), soil conditions (chemical characteristics, permeable or impermeable), and volume and type of percolating water.

There are two primary ways the fill can be saturated:

(1) The fill can be in contact with the ground water or surface water, resulting in direct horizontal leaching through the fill material.

(2) Water can be recharged down through the fill.

A considerable amount of water is required for the second condition; in arid climates, the normal incident rainfall is usually insufficient to saturate the fill. In climates with higher amounts of rainfall, saturated conditions may be created. During the construction of the fill, saturated conditions may be created by poor drainage conditions which allow water to percolate into the solid wastes. Unsatisfactory drainage and the application of excessive amounts of water to the surface, such as irrigating agricultural crops and watering of parks and golf courses, are potential problem areas for completed sites.

Ground water in the immediate vicinity of the disposal site may become grossly polluted and unsuitable for domestic or irrigation use if the solid wastes intercept the zone of saturation (i.e., below the level of the water table) or if the leachate reaches the ground water. Concentrations of common mineral constituents such as hardness, chloride, and total dissolved solids can increase many times over those found in unpolluted ground water. Tests have shown that continuous leaching of one acre-foot of refuse can result in a minimum extraction of approximately seven tons of various ions;[9] most of this material would be removed during the first year. Although studies have shown leachate from refuse fills to contain significant numbers of bacteria, the filtering action achieved in a few feet of soil will probably protect the ground water from bacterial contamination. Distribution of pollutants is largely controlled by the pattern of ground water movement. If pollutants leached from solid wastes reach the ground water, they will have the greatest travel in the direction of the ground water flow. Normally, only limited vertical diffusion will occur because of the limited mixing contions in the acquifer. An exception to this may occur in the vicinity of a well, since the natural pattern of water movement may be changed by pumping.

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[9] University of Southern California, Factors Controlling the Utilization of Sanitary Landfill Sites, Final Report to USPHS, National Institute of Health, by R. C. Merz and R. Stone, (Los Angeles, 1963).

The contact of decomposable solid wastes with surface water may also result in increasing the organic and mineral content of the adjacent surface water. In ponded water, the decomposing organic material will cause the water to become depleted of dissolved oxygen, resulting in production of odors and discoloration of the water.

Recently the Department conducted a study to review and evaluate the effects of solid waste disposal in the San Francisco Bay-Delta Area on ground and surface water quality.[10] The study indicated that the location of disposal sites in close proximity to the Bay-Delta surface waters may result in contact between the solid wastes and the water in the form of direct discharge of solid wastes, tidal action, levee seepage, or storm runoff. Forty-seven disposal sites were found to have contact with adjacent surface water. Presently, disposal sites in the Bay-Delta Area are the source of only small amounts of chemical and physical pollutants. It appears, however, that the disposal sites may be sources of bacterial organisms affecting the sanitary quality of adjacent surface waters. One serious problem noted at many of the disposal sites was water-caused nuisance conditions, particularly odors and appearance, resulting from improper solid waste disposal.

The disposal of chemical waste sludges also presents potential water pollution hazards. A 1965 report by the San Francisco Regional Water Quality Control Board presented a 14-page summary of chemical wastes being improperly disposed of at one site along San Francisco Bay.[11]

In the Bay-Delta report by this Department the following recommendation was made:

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[10] California Department of Public Health, Solid Wastes & Water Quality - A Study of Solid Wastes and Their Effect on Water Quality in the San Francisco Bay-Delta Area, (Berkeley, 1968).

[11] San Francisco Bay Regional Water Quality Control Board, Checking Program Report - Resolution 569, April 8 and 9, 1965.

WATER POLLUTION

Wastes dumped directly into river and ocean.

Wastes dumped directly into water.

> "In view of the potential hazard to surface water in the Bay-Delta Area, no toxic waste, insecticide residue, chemical waste or other similar hazardous material should be disposed of in sites which are within 500 feet of Bay-Delta surface waters."

[illegible]. GAS PRODUCTION

During the decomposition of refuse, gases are produced. The major gases are carbon dioxide and methane. Since methane is insoluble in water, it does not contribute to water pollution but is discussed under Section D, Effects on Land.

Carbon dioxide gase may diffuse through the soil and can be dissolved in water causing increased mineralization. Carbon dioxide combines with water to form carbonic acid which then can react with calcium or magnesium salts such as those present in many soils. In this process calcium and magnesium ions are released leading to increased hardness; carbonate is dissolved from the soil along with other impurities such as sulfates, chlorides, silicates, with the total reaction leading to higher mineralization of the water. The impact of gas production on the quality of the underlying ground water is not definitely known.

In California, water pollution and water quality control are under the jurisdiction of the State Water Resources Control Board and the Regional Water Quality Control Boards. Some refuse disposal sites (especially in Southern California) have waste discharge requirements adopted by these regulatory agencies prescribing conditions which must be prevented or limitations which must not be exceeded. Although subsequent water application to the finished site may produce leachate for many years, presently there is no administrative procedure available to control the discharge of materials from the disposal site after its completion and possible change in ownership.

The primary measure to prevent water quality impairment is maintaining a separation between the solid wastes and the adjacent surface water or underlying ground water. In this survey 33 disposal sites were found discharging solid wastes directly into water. Inadequate control of surface water drainage was found in 207 disposal sites. At 81 disposal sites the lowest part of the fill was or appeared to be in contact with underlying ground water.

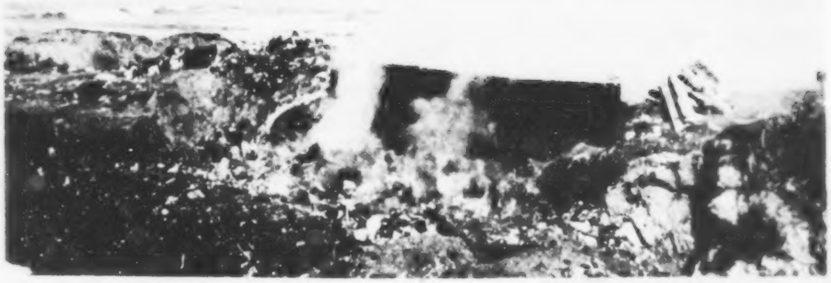
C. EFFECTS ON AIR

There are two classifications of air pollution problems related to solid waste disposal. The first type results from the discharge of smoke, particulate matter, dust, and odorous and possibly toxic vapors into the atmosphere. These conditions are objectionable in themselves in that they create hazards and annoyance to people and tend to decrease surrouding property values.

A subtle but immensely important part which refuse disposal can play in the field of air pollution involves the occurrence of urban-type smog. Smog in California may best be visualized as the end result of slow combustion in the atmosphere of gaseous hydrocarbon material to end products of aldehydes, organic acids and other irritants. The resulting aerosols may obstruct visibility, destroy or stunt the growth of sensitive plants, severely irritate the eyes and other mucous membranes of humans and perhaps increase morbidity and shorten life. Refuse disposal contributes to this situation principally through the inefficient combustion of solid wastes in dumps, back yard burning, and incinerators.

Burning of solid wastes at disposal sites has been prohibited by air pollution control districts in the two major metropolitan centers, the greater Los Angeles area and the greater San Francisco Bay Area. Figure VII-1 delineates the counties with disposal sites where wastes are burned. The counties where major amounts of solid wastes are burned are the more rural

OPEN



BURNING

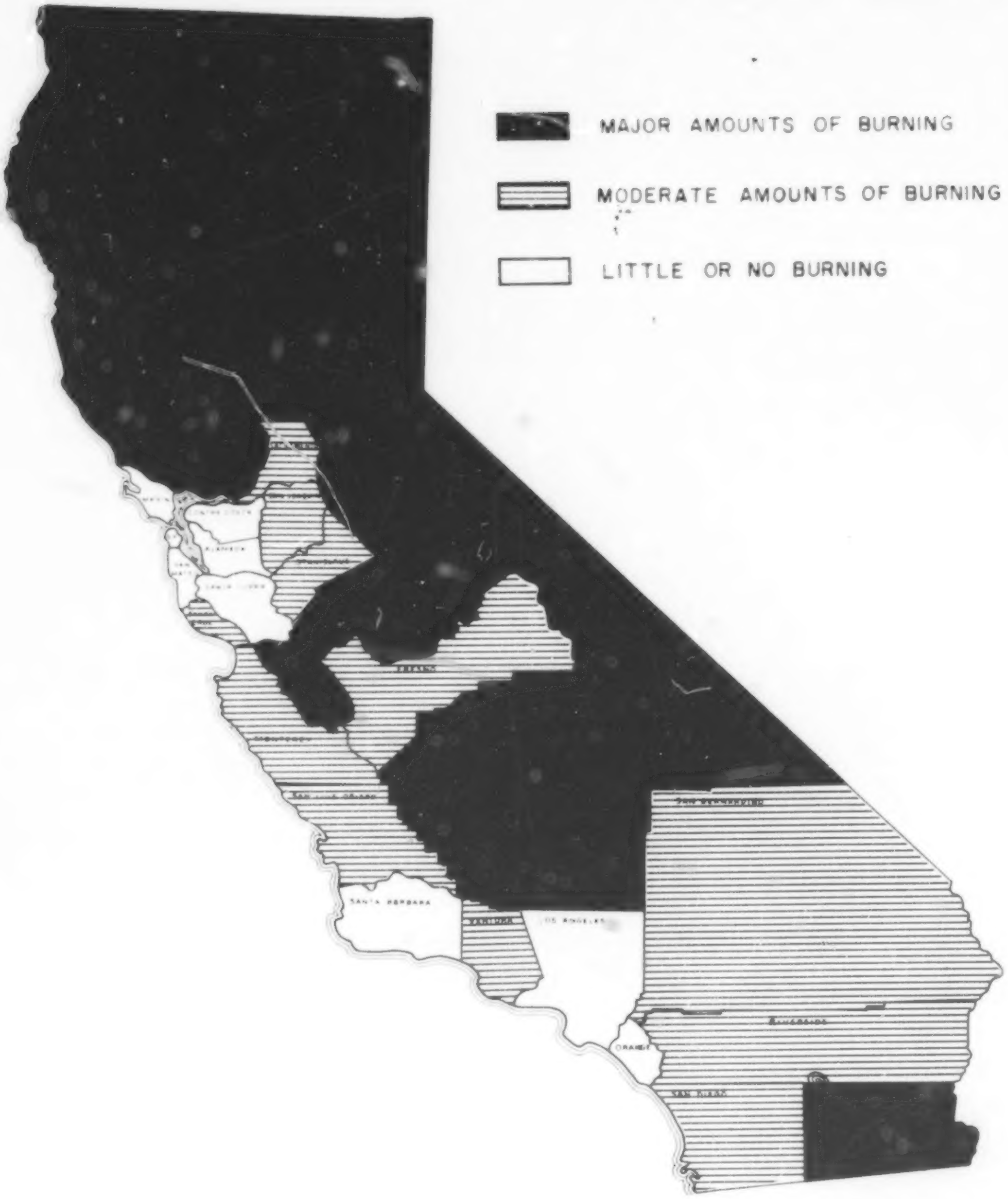
OF

SOLID

WASTES

FIGURE VII-1

COUNTIES WITH OPEN BURNING AT DISPOSAL SITES - 1967


■ MAJOR AMOUNTS OF BURNING
▤ MODERATE AMOUNTS OF BURNING
☐ LITTLE OR NO BURNING
MARIN
CONTRA COSTA
ALAMEDA
SAN MATEO
SANTA CLARA
FRESNO
MONTEREY
SAN LUIS OBISPO
SANTA BARBARA
VENTURA
LOS ANGELES
SAN BERNARDINO
RIVERSIDE
ORANGE
SAN DIEGO

CALIF. DEPT. OF
PUBLIC HEALTH

areas, generally being composed of agricultural land or undeveloped lands such as forest or range. As mentioned previously, there are 540 disposal sites (75 percent) in California where solid wastes are burned.

The principal advantage of open burning at disposal sites is the reduction in volume of a portion of the wastes. The combustion is, of course, uncontrolled and, therefore, the results are not uniform nor complete. The items with a high moisture content rarely burn. The small amount of burning which takes place around the edges is only sufficient to create the foul odors associated with burning garbage and does not reduce the environmental problems associated with putrescible wastes. Storage of green brush and the like for drying is a common practice, but it is unsightly and creates harborages for rodents and other animals infesting the site.

The pall of smoke rising from the open burning of refuse not only has unpleasant odors, but carries particulate matter into the air. Downwind areas are showered with the particulate matter as the gases cool.

Current disposal practices of agricultural solid wastes are also sources of air pollution. Dust and obnoxious odors from accumulations of manure are common in the vicinity of many cattle feedlots and dairies. Smoke from agricultural and lumbering waste burning operations also adversely affects the air quality of many portions of the state. Recently the new Sacramento airport had to be closed for several days because of low visibility resulting from the burning of rice stubble in neighboring counties.

D. EFFECTS ON LAND

Degradation of the value, usefulness, desirability, and beauty of land can result from inadequate, indiscriminate, or improper disposal of solid wastes. Land pollution results in a wide variety of adverse effects, some of which are obvious, others quite subtle.

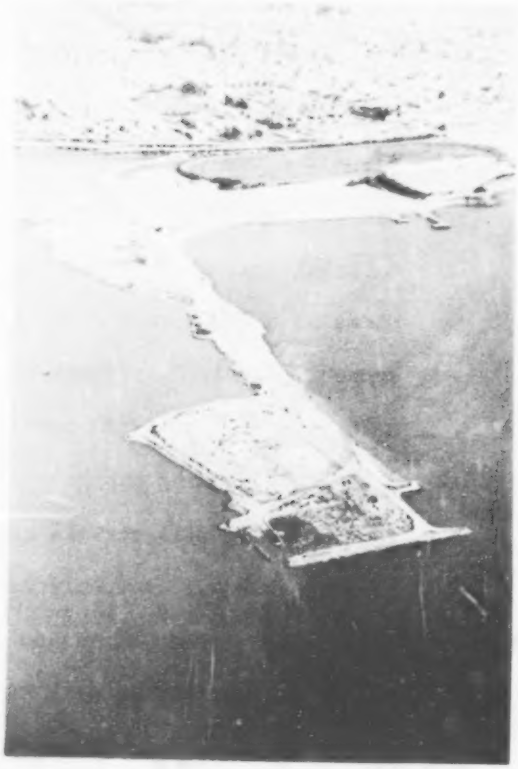
One of the more insidious forms of land pollution is the destruction of aesthetic values of land areas by unsightly burning dumps, exposed piles of refuse, indiscriminate littering, piles of junked automobiles and appliances, open piles of manure, and metal salvage operations. It is difficult to place actual dollar losses on scenic landscapes which have been defaced by improper solid waste disposal. Those attempting to sell land in the vicinity of a burning dump, however, are well aware of the lowered real estate values caused by the dump operation.

Prompt and adequate application of cover material does more to overcome the poor aesthetic conditions at disposal sites than any other single measure. The cover immediately removes the refuse from sight, which is extremely important. Compaction and prompt covering will also aid in reducing the amount of material scattered by the wind. Blowing papers not only create aesthetic problems at the disposal site but also nuisance problems when spread over adjacent property. Only 20 percent of the disposal sites in the state were considered to have effective paper control; over 50 percent of the disposal sites had no control of blowing paper.

Covering will contain most odors or control their release into the atmosphere. This will not only make the site more pleasant to people, but also reduce its attractiveness to insects, rodents, and other animals. In some areas, exposed refuse will attract large numbers of seagulls or ravens feeding on solid wastes. While principally an aesthetic problem, they are also a hazard to low-flying aircraft. Some 66 disposal sites were found to have bird control problems.

Although reclamation of solid wastes is held in high regard by some as a possible solution to the solid waste problem, salvaging at disposal sites is of questionable value. Successful salvage operations usually require the separated collection of waste materials to reduce the amount of other wastes

SAN FRANCISCO BAY FILLING WITH SOLID WASTES



LAND

DEGRADATION

Mt. Shasta in background.

Dumping in field near city
and in Redwood Forest.

Blowing paper from nearby dump.

which interfere with the salvaging process. At disposal sites, the mixed character of the solid wastes received does not lend itself to simple segregation processes and usually the value of the materials salvaged does not compensate for the resultant aesthetic and operational disadvantages. Much too frequently the salvage operations are better described as "scavenging" and "picking". Salvaging is not practiced at 78 percent of the sanitary landfills. It is practiced in 552 sites (77 percent of all sites) with most of these being dumps (UBD and SDB-type sites). Some 57 percent of the supervised dumps with burning store the salvaged material on site, providing an open market with resultant aesthetic problems. The salvaged materials make the operation appear unsightly and provide harborage for rodents.

A second form of land pollution is solid waste disposal which results in undesirable topographic changes. These topographic changes, while sometimes undesirable in themselves at the time, often result in subsequent environmental changes of much greater consequence. For example, the current popular practice of filling San Francisco Bay tidelands and marshlands with solid wastes may be objectionable from an aesthetic and conservation viewpoint. Perhaps more profound, however, are the resultant adverse effects on the ecology of the marine life of the bay, water and tidal currents and flushing action, and even the climate of the area.

Landfill operations that substantially raise the ground level in areas of flat terrain may result in interference with land drainage or may create barriers which obstruct views, both of which constitute a serious detriment to the environment of nearby residents.

Any finished landfill project should blend in with the landscape and be adaptable to an acceptable use. Positive results may be obtained through landfill operation such as the filling of quarries, marshlands, and canyons, creating more useable land area. It is important to remember that the final land does not have to be flat. The planned sculpturing of finished fills for use as golf courses and parks is an example of this. By not filling the disposal site "to the brim", the site may be more compatible with future land use. The location and planning at 575 (80 percent) of the existing sites in the state show no clear evidence of this kind of constructive long-term thinking. Some of the positive effects that are being achieved include land improvement for ultimate use, recreational use enhancement, or the elimination of an environmental hazard such as an abandoned quarry.

Organic material deposited in a fill undergoes biological decomposition and chemical changes, resulting in physical changes (subsidence) and gas production. The subsidence of a completed fill must be considered in the ultimate use. The amount of settlement will vary according to the degree of compaction, types of materials deposited, soil conditions, depth of fill and the amount of decomposition. Planning, design, and operation of a landfill which do not consider eventual subsidence may decrease the usefulness and capability of construction on the completed project. Thus, the ultimate use and beneficial value may be materially impaired.

The production of methane gas and its movement from landfills may present serious fire and explosion hazards to the neighboring areas and to buildings located on the landfill. Additionally, as the gas escapes from the disposal site, it may chemically burn trees, shrubs, and other vegetation. Methane concentrations of 10 percent were detected at a distance of 600-700 feet from several landfills under study by the Los Angeles County Engineer's office. The type of soil and pressure of gas in the fill are reported to be the dominant factors affecting the distance of gas movement. Gas control methods and venting should be carefully considered in the planning and use of completed landfill projects.

Surrounding land values can be seriously impaired because of fire hazards

POSITIVE RESULTS

OF

LANDFILLS

from an unsupervised burning dump. This is particularly true in forest and recreational areas. The large number of forest and brush fires caused by burning dumps led to the recent enactment of State Forestry regulations regarding fire protection. These regulations do not apply to all disposal sites, but are restricted to those located only in unincorporated areas. These fires are not only costly but threaten lives and property and result in subsequent land erosion and blight. The fire problem not only arises from the intentional burning at disposal sites, but more so from the unplanned or accidental fire. Some people feel a responsibility to burn the refuse they leave behind contrary to signs which often prohibit burning. The large amount of combustible material which accumulates at the open dumps between maintenance (generally between burning), or during periods when burning is not allowed, increases the danger from accidental fire. The cost of forest fires caused by burning dumps in California may well range into several million dollars annually.

In 1967, 134 disposal sites required the use of outside fire control equipment to suppress accidental fires. Many sites had two or more fires last year. In total, there were more than 250 fires at disposal sites that requiredoutside help to control. Several major fires were traced to fires escaping from disposal sites. One disposal site in San Francisco required fire control equipment 18 times in a three-month period, with almost 850 man-hours expended and the use of 65 pieces of apparatus. It is ironic that a number of small communities and cities have almost burned down from their own refuse disposal. The sites, however, remain and burning practices continue to threaten these same communities.

Table VII-2 indicates the status of fire protection measures found in existing disposal sites.

TABLE VII-2

FIRE PROTECTION AT DISPOSAL SITES

Type of Site	Type of Fire Protection Number of Sites			
	None	Firebreak	Water	Firebreak & Water
Uncontrolled Burning Dump	135	229	4	9
Supervised Dump with Burning	29	70	10	25
Modified Sanitary Landfill with Controlled Burning	2	12	4	11
Modified Sanitary Landfill	13	25	18	40
Sanitary Landfill	4	16	7	40
Other	6	5	0	2

VIII. SOLID WASTE PLANNING — CURRENT STATUS

The lack of adequate planning at all levels of government is one major deficiency in solid waste management in California. Few plans have been developed for the future, and present action is stimulated primarily by impending crises. In the minor amount of planning effort that has been accomplished, only the municipal fraction of the total solid wastes has been considered. As has been mentioned previously, authority in solid waste management is fragmented and cooperation is lacking. Coordination of local planning effort is badly needed between various jurisdictions and also between the departments within each jurisdiction. Even at the state level, no agency is charged with the authority or statutory responsibility for solid waste management.

Local governments (city, county and district) are empowered to control waste management practices within their own area of jurisdiction. Where policies, methods and standards do exist, they have been established without uniformity or benefit of guidance, meeting only the needs of the immediate local area. This approach tends to preclude taking advantage of broader-based operations which often could result in more economical operations with minimal adverse effects upon the environment. What appears to be urgently needed is a mechanism for stimulating planning for solid waste management on a rational geographical basis, coordinated to insure the maintenance of high standards of environmental quality.

A. STUDY AND PLANNING ACTIVITIES

Planning is an essential element of a solid waste program. Solid waste planning should provide an acceptable, immediate, and long-range plan or solution to the solid waste management problem. To aid in comprehending the fundamentals of solid waste planning, the following are listed as items which should be considered in a solid waste planning program:

(1) The Problem

Existing - Determination of present quantity and composition of solid waste, its seasonal variations and its geographical distribution. Determination of the source of all solid wastes (including industrial and agricultural, where applicable).

Future - Estimation of population and industrial growth for study period and prediction of geographical growth patterns. Estimation of future solid waste production.

(2) Objectives of the Plan

A statement of the goals, objectives and policies of the community regarding the needs and desires for management of solid wastes and the protection of environmental quality.

(3) Analysis of Collection Systems

Evaluation of collection and transportation systems and methods to determine the most economical and satisfactory methods consistent with the degree of service required by the public.

(4) Analysis of Disposal Systems

Evaluation of possible disposal methods required to meet the long-range needs of the area for the study period regarding economics, public health aspects, nuisance potential and public acceptability. Estimation of disposal capacity required for study period and remaining life of present disposal facilities.

(5) Evaluation of Total System

Evaluation of various combinations of collection, haul, transfer, processing, and disposal alternatives to arrive at the optimum overall solid waste program. Compare governmental operation with contractor or private operation of the solid waste program or certain phases thereof.

(6) Cost Estimates

Development of complete estimates of capital and operating costs for the various elements of the optimum solid waste program and for other alternatives.

(7) Method Of Implementation

Outline method of financing and implementing of the proposed program as well as the method of administration, control, and regulation.

(8) Report

Compilation of the results of the studies into a formal report which shows clearly the solid waste problem, the alternatives for dealing with the problem, evaluation of these alternatives, and the recommended program.

In California, study and planning activities in the field of solid waste management can be grouped into three categories: surveys, studies, and plans. Within the present status of solid waste management in California, there is little distinction between the contents of a study and a plan.

The following distinguishes the three categories of planning activities; key words have been underlined to indicate the specific differences:

(1) Surveys - evaluation and accounting of status of present conditions.

(2) Studies - consideration of various elements of the problem, comparison of alternate solutions and recommendations for future action.

(3) Plans - detailed program of action to solve problem, based upon evaluation of needs and possible solutions.

In summary, the study recommends necessary action and the plan is adopted to implement that action. The survey, study or plan can be further categorized in the field of solid waste management (or its elements such as refuse collection and/or disposal, or disposal sites); i.e., a survey of refuse disposal, a study of solid waste management, a plan for refuse disposal, a plan for solid waste disposal, etc.

B. EXISTING SOLID WASTE PLANS

Using the foregoing categories of study and planning activities, the status of planning has been compiled for California. The following list is a brief description of the study and planning activities undertaken by counties in the state; the absence of a county's name indicates no action had been taken by that county as of the end of 1967.

Contra Costa - Study of refuse disposal defining service areas, proposed location of future disposal sites, proposed regulation of collection and disposal operations. No action taken. Status report prepared by private consultant in 1963 reviewing refuse collection and disposal. Currently a comprehensive study of water-sewage and solid wastes is underway.

Fresno - A systems study of solid waste management is underway in central Fresno County as a U.S. Public Health Service solid waste demonstration project. All solid wastes generated in the study area, and all phases of the management system are considered.

Los Angeles - Original plan for refuse disposal established by Los Angeles County Sanitation Districts in 1955. Included detailed study of collection and disposal alternatives and recommended system of transfer stations and landfill for metropolitan area. Survey of refuse disposal facilities reviewed in 1965 report by County Engineer.

Mendocino - Survey of refuse disposal completed in 1967. Included review of county disposal site program and recommendations for future program.

Monterey - Refuse disposal site plan adopted in 1961 which indicated the areas where disposal sites should be established and method of financing. Recommended system of franchises be established for collection in unincorporated area.

Orange - Plan for refuse disposal adopted in 1959. Provides for location of landfills and transfer stations. Does not include collection of refuse. Program reviewed and second report prepared 1965.

Placer - Plan for refuse disposal sites adopted as element of county general plan in 1964. Provides for location, design criteria, and operation of county-wide system of disposal sites to handle needs to year 1980.

Sacramento - Plan for refuse disposal prepared in 1965 by a consultant. Subsequently, County Department of Public Works completed three-phase study to evaluate site locations. Only northern half of county included in plan.

San Benito - Study of refuse collection and disposal prepared in 1966 by a consultant. Studied collection and disposal needs for portion of county in San Juan Bautista-Hollister area.

San Bernardino - Survey of refuse disposal completed in 1959. Reviewed disposal needs, method of financing for disposal program for 10-year period.

San Joaquin - Plan for refuse disposal prepared in 1967 by a consultant. Studied disposal needs of entire county and recommended areas where disposal sites should be established. Recommended franchised collection in unincorporated area.

San Mateo - Study of refuse disposal sites completed by consultant in 1963. Studied disposal needs and recommended areas where disposal sites should be established. Considered volume of refuse generated by both San Mateo and San Francisco counties. No implementation by county.

Santa Barbara - Plan for refuse disposal established in 1965. Provides for location of transfer station and landfills. Includes only south coastal area of county.

Santa Clara - A regional study of solid waste disposal is currently underway as a Public Health Service solid waste demonstration project. All solid wastes generated in the county are considered. Collection of solid wastes not included.

Sonoma - Preliminary refuse disposal plan completed in 1967. Studied disposal needs of county and recommends county-wide system of disposal sites. Wastes from cities included. Does not include collection of refuse.

Ventura - Plan for refuse disposal completed in 1967. Provides for location of landfills serving entire county. Does not include collection of solid wastes.

In summary, only 16 of the 58 counties have undertaken study and planning activities. These activities generally have been very rudimentary.

No county has a complete solid waste management plan. The only comprehensive study undertaken which considers all aspects of solid waste management and the total environment is in Fresno County. This rather elaborate study is a demonstration project funded in part by the U.S. Public Health Service and administered by the State Department of Public Health. The regional solid waste management study also underway in Santa Clara County considers all solid wastes, but is oriented only to the disposal aspects.

Of the 14 other counties, only seven counties have actual plans. These seven plans are related to the disposal of residential and commercial refuse only; two of these plans basically define disposal site locations only. The activities of the other seven counties include three counties with studies completed, one county with a solid waste study underway, and three counties with surveys of refuse disposal.

The deficiencies of the seven existing plans include lack of planning for the entire county, for the entire waste loading, and for extended time periods. The jurisdictional areas covered by the plans include the entire county in five plans; the other plans were restricted to only portions of a county. Incorporated areas were considered in all seven plans. An example of this is Orange County where the volume required in the disposal sites includes that needed for disposal of municipal solid wastes from the cities in the county.

With the exceptions of the Fresno and Santa Clara studies, industrial and agricultural solid wastes were not considered in any plans. The exclusion of these materials leaves the management of these wastes a responsibility of the individual waste producers. Also not included were abandoned vehicles, sludge from sewage treatment facilities, residues from street cleaning operations, and dead animals. All of these wastes should be considered in a solid waste management plan.

A definite future planning period was not considered in all plans. The plans that did not incorporate a specific design period assumed existing conditions would continue and that the plan would be amended when required. In others, the planning period ranged from five to thirty years into the future. If the solid waste management program is to function effectively, long-term advance planning is needed; this is especially necessary if sufficient disposal site capacity is to be obtained in the metropolitan areas.

Cooperative handling of solid wastes from adjacent counties was not considered in any existing plans. In the study of disposal sites for San Mateo County, wastes from San Francisco were included because they had been historically disposed of in San Mateo County. Presently 25 counties export a portion of their refuse. Three counties have adopted specific regulations which prohibit the importation of garbage or refuse into the county; however, wastes from two of these three counties are exported to neighboring counties. Counties which operate "free" (no charge) sites usually prohibit the dumping of wastes at these sites to all but county residents. This situation, in essence, restricts the flow of wastes from one county to another. A few counties have entered into cooperative agreements for joint use of sites near county lines where small populations are concerned. In these cases maintenance costs are divided in some proportion to the use of the sites.

Similar to the status of county solid waste planning, very few cities have conducted solid waste planning. Most of these efforts have been limited to studies related to disposal; optimum collection systems are usually not a part of the study or plan. Existing city study and planning activities consider only municipal wastes and include planning for the city area only.

Only ten percent of the cities are engaged in a program which actively involves their participation with another jurisdiction in solid waste planning or operation of disposal facilities. An additional 30 percent are included in the plans of other jurisdictions but do not take an active part in the development or implementation of the program. Numerous cities in California have delegated the responsibility for planning for future solid waste disposal programs to private collectors and scavengers.

Disposal sites are not allowed by existing local zoning regulations in 137 cities. This, coupled with urbanization and a lack of open land necessitates the dependency of many California cities on other jurisdictions for disposal areas. Presently, only 33 cities dispose of their municipal wastes within their own boundaries; 293 cities are totally dependent on another jurisdiction for a place to dispose of their solid wastes and the other 73 are partially dependent. Cities most dependent on other jurisdictions for location of disposal sites are commonly those which are the most reluctant to engage in cooperative action or joint use of disposal facilities. This is often the result of public officials shirking their responsibilities in protecting the health and welfare of the public.

It is conceded that the poor operations generally in use have caused the negative attitude toward the disposal of solid wastes resulting in location of these facilities away from populated areas. As municipalities improve and upgrade their operations and the public becomes more aware of the difference between a dump and a sanitary landfill, solid waste planning is more readily integrated into the comprehensive planning of a community or region.

C. AGENCIES WITH PLANNING RESPONSIBILITIES

As was previously indicated, complete planning for solid waste management has been quite limited. The various county agencies which have the primary responsibility for solid waste planning in their respective counties are shown in Table VIII-1. Most of the planning effort conducted by these agencies is limited to disposal planning only and usually limited only to finding a new site when the immediate need arises.

TABLE VIII-1

COUNTY AGENCY PRIMARILY INVOLVED IN SOLID WASTE PLANNING

Agency	Number of Counties
Public Works Department	18
Road Department	10
Administration	8
Health Department	7
Planning Department	7
Engineering Department	3
Special Solid Waste Agency	2
Refuse Committee	1
No Agency Involved	2

The public works and road departments are the agencies most frequently responsible for solid waste disposal planning, principally because they are the present operators of the disposal sites. Specific agencies grouped into the administration classification include the board of supervisors, county administrative officer, finance department and purchasing department.

The various city agencies primarily involved in solid waste planning are shown in Table VIII-2.

TABLE VIII-2

CITY AGENCY PRIMARILY INVOLVED IN SOLID WASTE PLANNING

Agency	Number of Cities
Administration	157
Public Works Department	124
Planning Department	23
Engineering Department	8
Special Solid Waste Agency	5
Health Department	2
Road Department	1
No Agency Involved	79

The city agencies most frequently involved are the administrative and public works departments; planning responsibilities are undertaken by the administrative sections in the smaller cities and by public works departments in the larger cities. Seventy-nine cities have no agency involved in solid waste planning.

Solid waste planning by local district agencies has been limited to only those which operate disposal programs. Much of the planning activity of the districts has been in the form of disposal site evaluation. The Los Angeles County Sanitation Districts are a notable exception. The districts have entered into several joint power agreements with the County of Los Angeles and through these agreements the districts have conducted studies of solid waste disposal in Los Angeles County. These studies have not been limited to only the areas within the districts, but have been applied to the entire county, with special emphasis on the metropolitan area. In general, these studies have been limited to municipal wastes.

Their program encourages private enterprise to operate landfills in the hope that a large portion of the short-range need will continue to be met in this manner. The districts' funds can then be used to provide long-range facilities which are not so attractive to the private investor. As part of their activities, the Los Angeles County Sanitation Districts have also studied other methods of disposal. Methods considered were incineration, composting, central-grinding stations with discharge into the sewerage system, and disposal at sea. Considering all factors, the districts believe that the sanitary landfill will continue to be the most practical method of solid waste disposal in Los Angeles County. The districts are not empowered to collect wastes and, therefore, their planning activities are restricted to transfer and disposal facilities. Regulation of the collection system for solid wastes in Los Angeles County remains dispersed among the individual jurisdictions.

The two garbage and refuse disposal districts (this particular type of district can no longer be established) in the state are also examples of cooperative planning action. The six cities on the Monterey Peninsula and Monterey County formed a district for the cooperative and coordinated disposal of solid wastes. This district has completed one disposal site and is operating a second which is projected to last in excess of 50 years. As in Los Angeles County, responsibility for collection remains with the cities. The South (San Mateo) County Garbage and Refuse Disposal District is the other such district conducting a similar program. Presently, dissension among some of the member cities is threatening the stability of the district and it is questionable whether this district will continue to operate.

Several multi-jurisdictional agencies are giving more attention to solid waste problems in their respective areas. The Association of Bay Area Governments (ABAG), covering the nine-county San Francisco Bay Area, probably has been the most active. The State Department of Public Health conducted an inventory study of refuse disposal needs in 1963-65 as requested by ABAG, as part of the Association's regional planning program. This study pointed out the need for solid waste management on a region-wide basis in the Bay Area. No formal action has been taken to date.

Since solid waste disposal affects the various elements of our environment -- land, air, and water -- it is natural that regional regulatory agencies should become alerted to the necessity of planning for proper disposal of solid wastes. Actions taken by each of these agencies can affect solid waste management as shown by the following examples. The Bay Conservation and Development Commission (BCDC), created by the State Legislature to regulate the filling of San Francisco Bay, controls and limits the landfilling projects around the periphery of the bay. Hence, the amount of land potentially available for solid waste disposal has been reduced. This is in effect forcing the location of many future sites into inland areas. If air quality control agencies ban back yard burning of rubbish, the urban dweller is usually burdened by an increased volume of wastes requiring disposal off of his premises. In many communities. the existing collection system may not be capable of handling this overload. If augmented collection service is not provided, these materials may end up "stockpiled" in back yards. Regional water quality control agencies are also adopting stricter standards of operation for solid waste disposal sites in their fight to preserve the quality of waters in the state. Each of these regulatory agencies is fulfilling the individual purpose for which it was created. A basic need is the coordination of solid waste planning to fit solid waste disposal practices into these controls, thus achieving the end result -- a better environment.

APPENDIX A

STANDARD INDUSTRIAL CLASSIFICATION

(SIC)

APPENDIX A

STANDARD INDUSTRIAL CLASSIFICATION (SIC)

The Standard Industrial Classification (SIC) has been prepared by the Office of Statistical Standards in the Federal Bureau of the Budget.[1] This classification was developed for the purposes of collecting, tabulating, presenting, and analyzing data in a uniform and comparable manner by the various agencies, associations, and organizations presenting statistical data. Establishments are classified by the type of activity in which they are engaged. The SIC covers the entire field of economic activity which is divided into the following divisions: (A) agriculture, forestry, and fisheries; (B) mining; (C) construction; (D) manufacturing; (E) transportation, communication, electric, gas, and sanitary service; (F) wholesale and retail trade; (G) finance, insurance, and real estate; (H) services; (I) government; and (J) nonclassifiable establishments. The 1967 edition of the SIC manual has been utilized in this report.

The industrial wastes considered in this report have been limited to those from manufacturing establishments (Division D) and wastes from the fresh pack of fruits and vegetables (a portion of Division A). The above establishments were considered to constitute the major solid waste producers in terms of industrial processing wastes. The manufacturing division is defined in the 1967 manual as follows:

> "The manufacturing division includes those establishments engaged in the mechanical or chemical transformation of inorganic or organic substances into new products, and usually described as plants, factories, or mills, which characteristically use power-

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[1] Office of Statistical Standards, Bureau of the Budget. Standard Industrial Classification Manual, 1957 and 1967 editions.

> driven machines and materials handling equipment. Establishments engaged in assembling component parts of manufactured products are also considered manufacturing if the new product is neither a structure nor other fixed improvement.
>
> "The materials processed by manufacturing establishments include products of agriculture, forestry, fishing, mining, and quarrying. The final product of a manufacturing establishment may be "finished" in the sense that it is ready for utilization or consumption, or it may be "semi-finished" to become a raw material for an establishment engaged in further manufacturing. For example, the product of the copper smelter is the raw material used in electrolytic refineries; refined copper is the raw material used by copper wire mills; and copper wire is the raw material used by certain electrical equipment manufacturers.
>
> "The materials used by manufacturing establishments may be purchased directly from producers, obtained through customary trade channels, or secured without recourse to the market by transferring the product from one establishment to another which is under the same ownership. Manufacturing production is usually carried on for the wholesale market, for interplant transfer, or to order for industrial users, rather than for direct sale to the domestic consumer.
>
> "Printing, publishing, and industries servicing the printing trades are classified as manufacturing industries.
>
> "There are borderline cases between the manufacturing division and the other divisions in the classification system. Specific instances will be found in the descriptions of the individual industries."

In the SIC system, a four-digit code is assigned to each establishment based on its major activity, which is determined by the product or group of products produced or handled, or by services rendered. The first two digits signify the major group within the division. The third digit indicates the industrial group number within the major group, and the fourth digit specifies the type of industry within the group. As an example, consider the manufacturing of food products:

Major Group	20	Food and Kindred Products
Industrial Group	203	Canning and preserving fruits, vegetables and sea food
Industry	2037	Frozen fruits, fruit juices, vegetables and specialities

The manufacturing division includes major groups 19 through 39. All of these major groups have been included in this report except 21 - Tobacco Manufacturers - which is not applicable in California. The following is a listing of the applicable major groups:

19 - Ordinance and Accessories
20 - Food and Kindred Products
22 - Textile Mill Products
23 - Apparel and Other Finished Products Made from Fabrics and Similar Materials
24 - Lumber and Wood Products, Except Furniture
25 - Furniture and Fixtures
26 - Paper and Allied Products
27 - Printing, Publishing, and Allied Industries
28 - Chemicals and Allied Products
29 - Petroleum Refining and Related Industries
30 - Rubber and Miscellaneous Plastic Products
31 - Leather and Leather Products
32 - Stone, Clay, Glass, and Concrete Products
33 - Primary Metal Industries
34 - Fabricated Metal Products, Except Ordinance, Machinery, and Transportation Equipment
35 - Machinery, Except Electrical
36 - Electrical Machinery, Equipment and Supplies
37 - Transportation Equipment
38 - Professional, Scientific, and Controlling Instruments; Photographic and Optical Goods; Watches and Clocks
39 - Miscellaneous Manufacturing Industries

APPENDIX B

SUMMARY OF STATE LAWS AND REGULATIONS

APPENDIX B

SUMMARY OF STATE LAWS AND REGULATIONS

The following includes state regulations related to solid wastes. A brief excerpt, by section numbers in the various codes, is presented to provide information on their content.

Health and Safety Code

Section No.	
850-972	Local Health District may acquire, construct, maintain, and operate all works and equipment necessary for the disposal of garbage and waste.
4100-4165.7	Garbage Disposal District may provide for the collection and disposal of garbage or other refuse matter of the district.
4170-4197	Garbage and Refuse Disposal District may maintain and operate a garbage disposal site. This district cannot be formed after October 1, 1961.
4200-4204	Any county may grant a franchise, exclusive or otherwise, for the collection and disposal of garbage, waste, offal, and debris.
4250	Any city may contract for the collection or disposal of garbage, waste, refuse, rubbish, offal, trimmings, and other refuse matter.
4260	No city, county, district or public or municipal corporation shall acquire and operate a disposal site, collection point, or transfer station for garbage or refuse within a city without the consent of the city council, or within the unincorporated area without the consent of the board of supervisors.
4300-4302	No person shall operate a crematory for the destruction by "fire heat" of garbage, ashes, offal, or other refuse matter unless operated in such a manner as will prevent the propagation of disease through the contamination of the atmosphere.
4303	Every person who destroys or who attempts to destroy the carcass of any dead animal, or the offal from any slaughter pen. . . within one-fourth mile of any city, town, or village, except in a crematory, the construction and operation of which is satisfactory to the board of health of the city or the health officer of the town, is guilty of a misdeameanor.
4400-4485	Pollution of waters and public places include the following items:

(4400) For the purpose of this article the term "garbage" includes any or all of the following:

(a) garbage
(b) swill
(c) refuse
(d) cans
(e) bottles
(f) paper
(g) vegetable matter
(h) carcass of animal
(i) offal from any slaughter pen or butcher shop
(j) trash
(k) rubbish
(l) radioactive waste materials

(4401) Unlawful to deposit garbage in or upon the navigable waters of the state or at any point in the ocean within 20 (twenty) miles of the coastline of the state.

(4450) No person shall put the carcass of any dead animal or the offal from any slaughter pen, corral, or butcher shop into any river, creek, pond, reservoir, or stream.

(4457) Every person who violates, refuses or neglects to conform to any sanitary rule, order, or regulation prescribed by the State Department of Public Health for the prevention of the pollution of springs, streams, rivers, lakes, wells or other waters used or intended to be used for human or animal consumption is guilty of a misdeameanor.

(4475) As used in this article, "garbage" includes any or all of the following: (a-k same as 4400), (l) abandoned and unidentifiable vehicles or vehicle bodies, (m) abandoned iceboxes and refrigerators.

(4476) Prohibits throwing of garbage on streets, alleys, etc. (does not apply to the use of private property with permission of owner).

4700-4859 County Sanitation District may construct, maintain, and operate within the district boundaries a system for transfer or disposal of refuse or both; provided, however, that such system shall not include "refuse collection", which is defined as the house-to-house pickup of refuse or any part thereof.

In this article "refuse" includes all of the following: (a) animal, fruit and vegetable refuse; (b) offal; (c) leaves and cuttings, trimmings from trees, shrubs and grass; (d) inorganic refuse and rubbish; (e) garbage; (f) anything thrown away as worthless.

6400-6941.9 Sanitary Districts may acquire, construct, maintain and operate such garbage dump sites and garbage collection and disposal systems. Before any garbage dump shall be established, the location shall first be approved by the county health officer, and if the location is within two (2) miles of any city, the consent of the governing body of the city shall first be secured. It may make and enforce all necessary regulations and compel all residents and property owners in the district

	to use the garbage collection and disposal system.
18680-18681	Metal or plastic waste containers with tight-fitting lids shall be provided in every mobile home park and removed and disposed of without creating a nuisance. The area of the park shall be kept clean and free of refuse, garbage, rubbish, etc., (Mobile Homes and Mobile Home Parks Act).
24198-24399	Air Pollution Control District may adopt regulations to prevent open burning of solid wastes from any source. Empowered to set requirements for incinerator stack emissions.
28201	Every bakery must provide for the sanitary storage and the adequate frequency of removal of all food wastes and waste material (Bakery Sanitation Law).
28565-28568	Same as above, for restaurants (Restaurant Act).
28610-28613	Same as above, for itinerant restaurants (Itinerant Restaurant Sanitation).

Administrative Code - Title 17

313,871.7 and 5117(d)	Hospitals - Garbage shall be stored and disposed of in a manner not to permit the transmission of communicable disease, etc. All containers shall be watertight, have tight-fitting covers, and be rodent proof.
314,429 and 5122	Hospitals - Infected dressings, surgical dressings and other similar materials shall be disposed of in an incinerator which will provide complete combustion. Alternate methods may be allowed if approved by local health officers.
440	Hospitals - An area shall be provided for storage of garbage and trash. In all facilities of more than six beds, a room or screened enclosure with minimum cement floor (25 sq. feet) shall be provided, etc.
1325	Local Health Service - Funds available to local health departments for use only to augment local appropriations provided for public health purposes, including garbage and refuse collection and disposal.
7955	Sanitation, Healthfulness and Safety of Ocean, Water-Contact Sports Areas, -- "Refuse" means domestic or industrial garbage, trash, or other debris not of sea origin.
30285	No user shall dispose of any radioactive material as waste except: (a) by transfer to a person holding a specific license to receive the radioactive wastes, or, (b) as authorized pursuant to Section 30269 -- Concentrations in effluents to uncontrolled areas; 30287 --

Disposal by release into sanitary sewerage systems; 30288 -- Disposal by burial in soil.

30731 Organized Camps - Requires the sanitary storage of refuse containers.

Agricultural Code

16001-16154 "Garbage" means waste materials, such as food scraps, table refuse, galley refuse, and refuse from stores of vessels and aircrafts, including such waste materials in passengers' and crews' quarters, which is derived, in whole or in part, from fruits, vegetables, or animal products. (16004)

If means of incineration of, or other approved processing, garbage are not available aboard any vessels, . . . the master. . . shall provide containers, . . . with tight-fitting covers in which garbage shall be retained while within the territorial waters or on land in California, pending incineration or approved treatment. (16101)

It is unlawful for any person to throw. . . . garbage from any vessel, aircraft, etc., into territorial waters or onto land within the state, except for any of the following:

(a) Immediate burning in incinerators.
(b) Approved treatment and disposal under the supervision and pursuant to the regulations of the director.
(c) Delivery to garbage collector. . . licensed by the director or federal government. (16151)

10901-10990 "Garbage" - any waste which consists in whole or in part of animal waste that results from the handling, preparing, cooking, and consuming of food, including the offal from any animal carcass or from part of an animal carcass. It does not, however, include such waste from ordinary household operations which is fed directly to swine on the premises. (10901)

All garbage before being fed to swine shall be heated to $212^{o}F$ for 30 minutes. (10952)

Persons feeding garbage to swine must have annual license. (10982)

Fish and Game

5650-5652 Unlawful to dispose within 150 feet of the high water mark or to allow to pass into the waters of the state any refuse, liquid or solid. . . . However, 150 feet requirement does not apply to depositing of such materials in a container or "refuse disposal dump" maintained by any federal, state or local governmental agency, or the property owner.

Public Resources

4371-4375 4412-4446	A person shall not maintain a rubbish dump outside the exterior boundaries of any city unless he has a permit to do so issued by the State Forester and the rubbish dump is maintained, used, or operated in strict accordance with the terms and conditions prescribed in the permit. (Permit involves clearance of combustible materials around disposal facilities and burning restrictions.)
5780-5788	Park and Recreation District may provide "garbage collection" or disposal services in district where such service is not provided by any other public agency.
13000-13230	Resort Improvement District may acquire, construct, maintain, or operate facilities for the collection or disposal of "garbage and refuse matter".

Vehicle

23112-23113	No person shall throw or deposit any bottle, glass, garbage, etc., on any highway or street.
23114-23115	No vehicle loaded with garbage, swill, cans, bottles, etc., shall be driven or moved upon any highway unless the load is covered with a cover sufficient to prevent the load or any part of the load from spilling upon the highway. Does not apply to vehicles engaged in transportation of wet waste fruits or vegetable matter from a food processing establishment.
22659-22856	Provides for the removal of parked and abandoned vehicles.

Streets and Highways

224	Unlawful to deposit or throw waste in safety roadside rest, other than in receptacle, ...
745-759.3	Unlawful to locate junk yard within 1,000 feet of highway without compatible zoning and screening. Provides for screening of junk yards visible from highway.
888.2	Unlawful to deposit or throw any substance in parkway or deposit in receptacle items other than that which arise out of the use of the parkway by a member of the traveling public.

Penal

370-373(a)	Unlawful to create public nuisance.

374a-375	Unlawful to deposit or dump on any public highway, private highway, or private property any garbage, bottles, etc. Not restricted to private owner and use of his own property. Unlawful to deposit, dump garbage, etc., within 150 feet of high-water mark.

Government

23010.2	The board of supervisors may loan money to any city within its limits for collection as indicated in 25827.
25210-25210.8	County Service Area may provide any service that a county is not prohibited from doing.
25820-25822	The board of supervisors may acquire, construct, contract, alter, enlarge, maintain, and operate dump sites, incinerators and other disposal plants for the disposal of combustible or noncombustible garbage or rubbish or both; and may permit the use of, by lease or otherwise, by municipalities or other governmental agencies.
25827	The board of supervisors of each county may collect or contract for the collection or both, of garbage, waste, refuse, etc., and may for the purposes levy a yearly tax on property within the unincorporated area of the county, excluding territory within existing garbage disposal districts.
38790	By gift, purchase, etc., any city may acquire land within the county where the city is located for garbage disposal sites and rights of way for roadways to the site. "Garbage" includes: (a) animal, fruit and vegetable refuse; (b) offal; (c) leaves and cuttings, trimmings from trees, shrubs and grass; (d) inorganic refuse and rubbish; (e) anything thrown away as worthless.
61000-61936	Community Services District may be formed in the unincorporated territory in one or more counties to provide "garbage service".
65303	Elements permitted, not required in the general plan, may include the following or any part or phase thereof. . . (f) public services and facilities element showing general plans for sewerage, refuse disposal, drainage, and local utilities, and rights of way, easements and facilities for them.

Water Code

30000-33240	County Water District may acquire, construct, and operate facilities for, or may contract with others for, the collection and disposal of the "garbage waste" and "trash" of the district and its inhabitants.

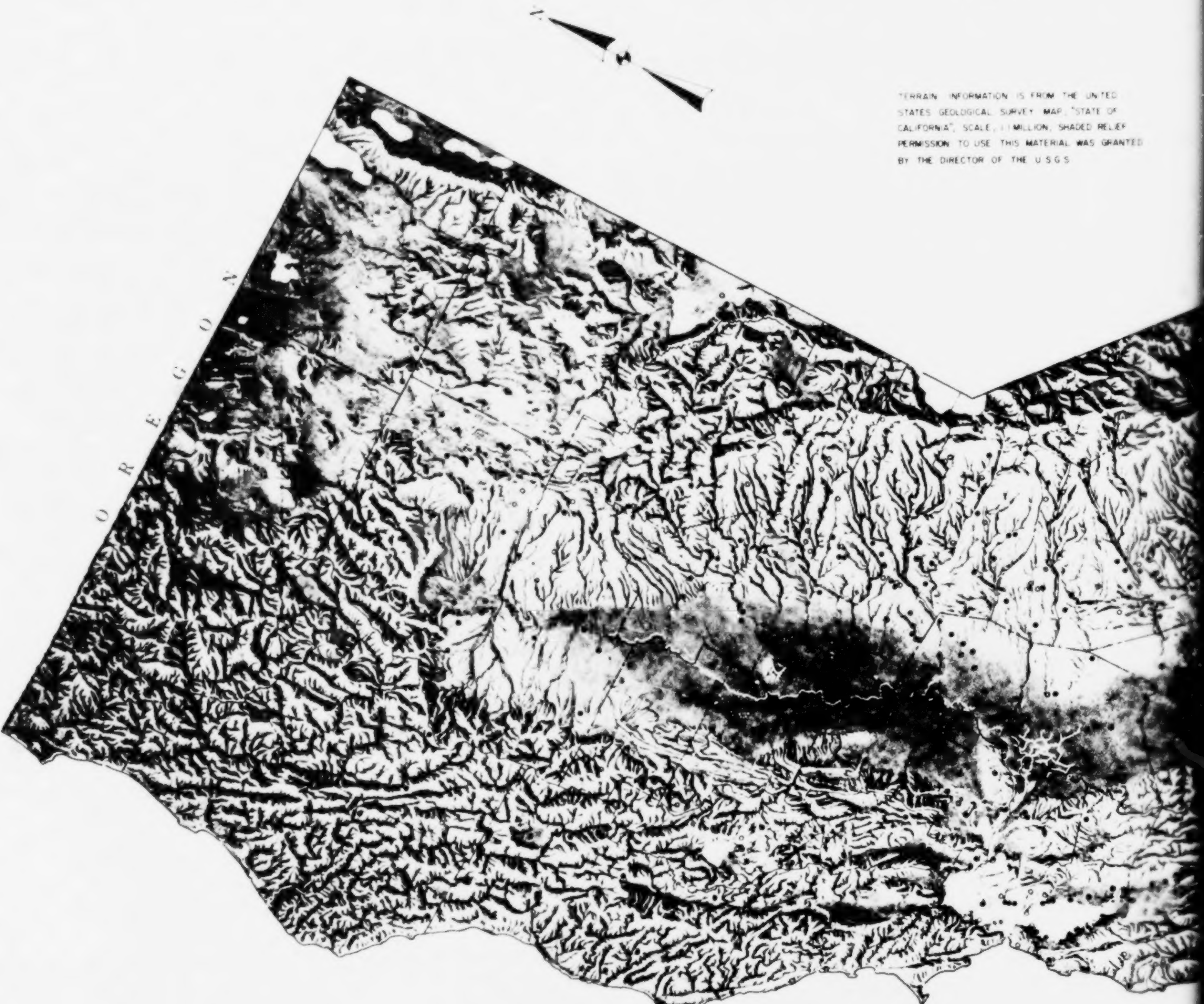
Public Utilities Code

11501-14509	Municipal Utility District may acquire, construct, operate, etc., within or without the district, facilities for supplying a means for the collection, treatment, or disposition of "garbage and refuse matter".
15501-18055	Public Utility District - Activities similar to those of a Municipal Utility District.

APPENDIX C

CALIFORNIA DISPOSAL SITES

-1967-



LEGEND

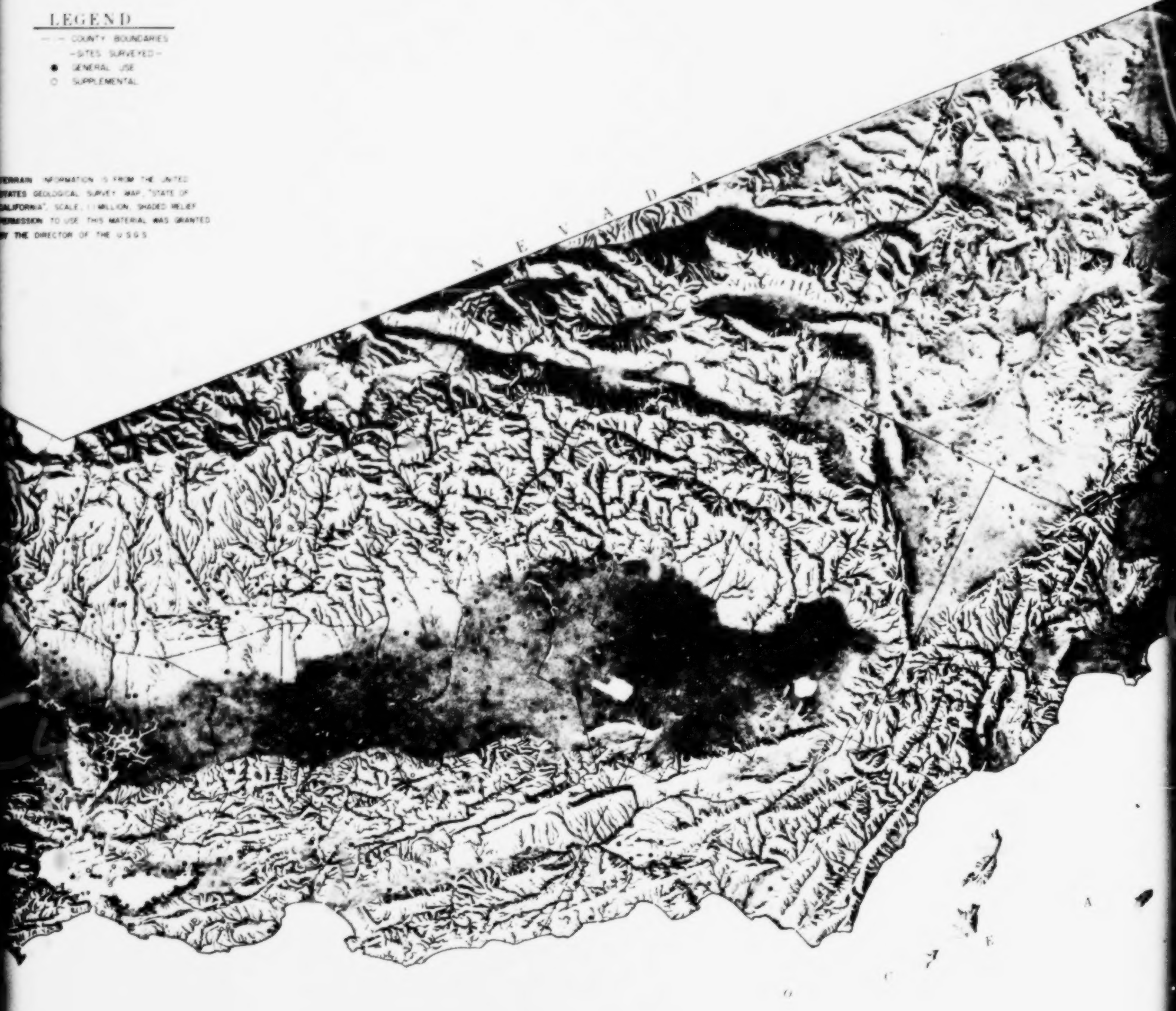
— — COUNTY BOUNDARIES

-SITES SURVEYED-

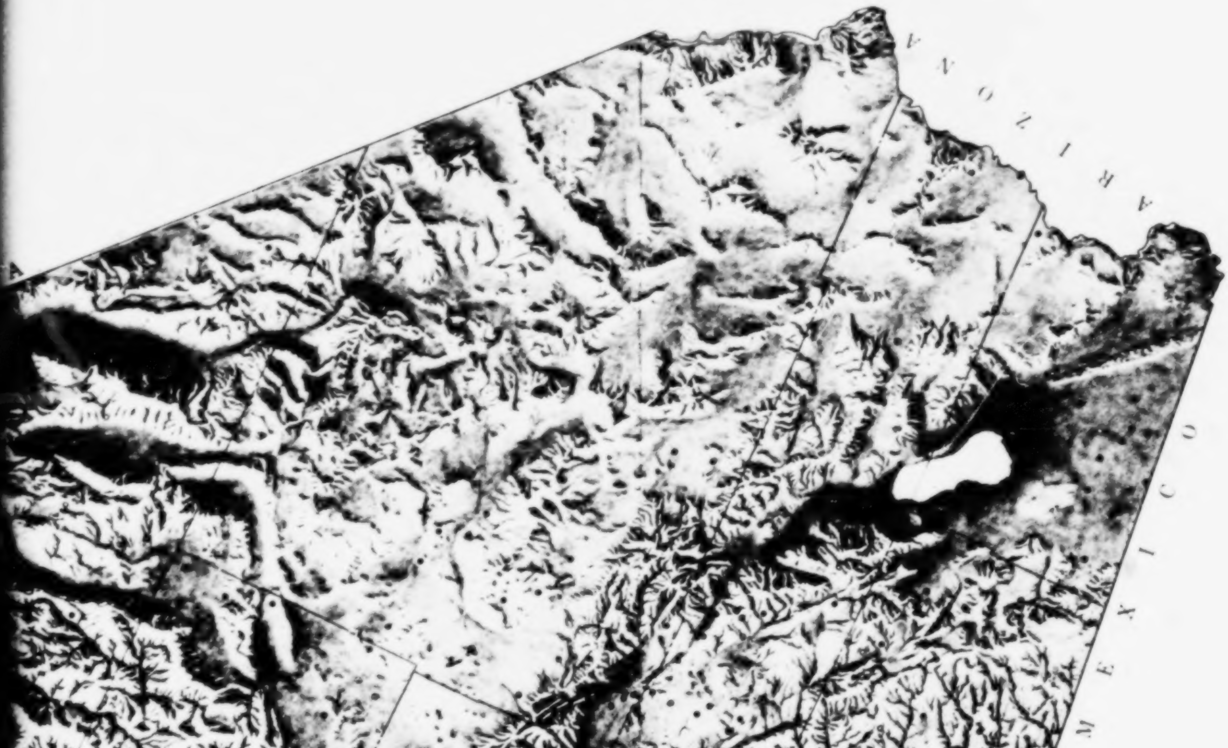
● GENERAL USE

○ SUPPLEMENTAL

TERRAIN INFORMATION IS FROM THE UNITED STATES GEOLOGICAL SURVEY MAP, "STATE OF CALIFORNIA", SCALE, 1:1 MILLION, SHADED RELIEF. PERMISSION TO USE THIS MATERIAL WAS GRANTED BY THE DIRECTOR OF THE U.S.G.S.


LEGEND
— · — COUNTY BOUNDARIES
—SITES SURVEYED—
● GENERAL USE
○ SUPPLEMENTAL
NEVADA
O C E A

TERRAIN INFORMATION IS FROM THE UNITED STATES GEOLOGICAL SURVEY MAP, "STATE OF CALIFORNIA", SCALE, 1:1 MILLION, SHADED RELIEF. PERMISSION TO USE THIS MATERIAL WAS GRANTED BY THE DIRECTOR OF THE U.S.G.S.


ARIZONA
MEXICO
OCEAN

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC HEALTH

CALIFORNIA DISPOSAL SITES

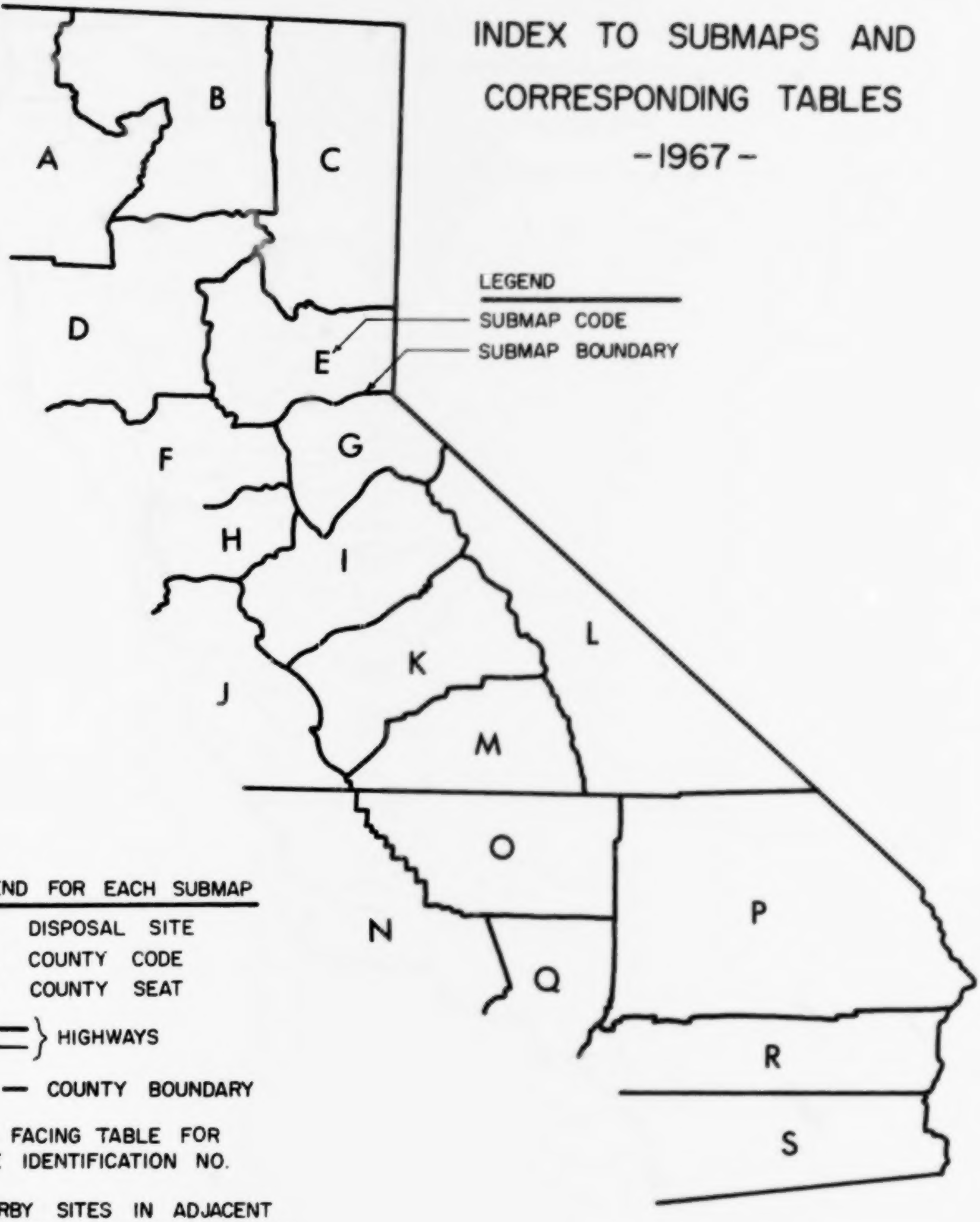
-1967-

APPENDIX D

DISTRIBUTION AND LOCATION OF DISPOSAL SITES WITH RELATED DATA BY COUNTY

INDEX TO SUBMAPS AND CORRESPONDING TABLES

-1967-


LEGEND
SUBMAP CODE
SUBMAP BOUNDARY
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LEGEND FOR EACH SUBMAP

● DISPOSAL SITE
(00) COUNTY CODE
★ COUNTY SEAT
═ } HIGHWAYS
--- COUNTY BOUNDARY

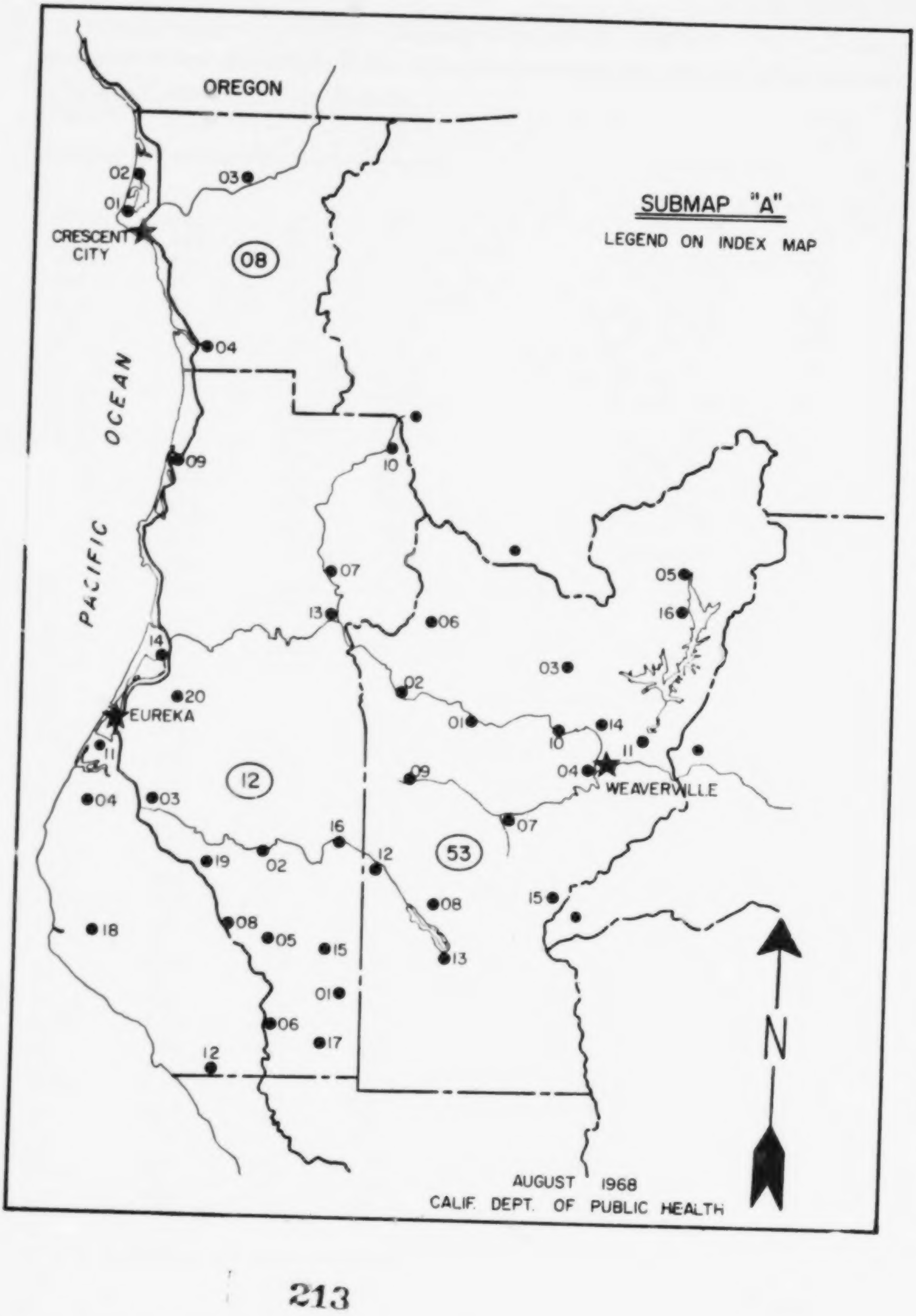
SEE FACING TABLE FOR SITE IDENTIFICATION NO.

NEARBY SITES IN ADJACENT COUNTIES PLOTTED BUT NOT IDENTIFIED ON THIS SUBMAP

SOLID WASTE DISPOSAL SITES

Site Code	Site Name	Type of Site 1/	Operator 2/	Total Acreage	Daily Tonnage 3/
(08) DEL NORTE					
01	CRESCENT CITY	SDB	CO	040	0010
02	FORT DICK	UBD	CO	022	<1
03	GASQUET	UBD	CO	006	<1
04	KLAMATH	UBD	CO	018	<1
(12) HUMBOLDT					
01	ALDERPOINT	UBD	CO	002	<1
02	BRIDGEVILLE	UBD	CO	001	<1
03	EEL RIVER GARBAGE CO	UBD	PVT	005	0020
04	FERNDALE	UBD	CO	003	0001
05	FRUITLAND	UBD	CO	001	<1
06	GARBERVILLE	UBD	CO	003	0004
07	HOOPA	UBD	CO	070	0001
08	MOORE	UBD	PVT	040	<1
09	ORICK	UBD	CO	007	0001
10	ORLEANS	UBD	CO	012	0001
11	TABLE BLUFF	UBD	CO	001	0010
12	THORN	UBD	CO	001	<1
13	WILLOW CREEK	UBD	CO	002	0001
14	ARCATA	MSLB	PVT	080	0055
15	BLOCKSBURG	UBD	CO	001	<1
16	DINSMORE	UBD	FED	001	<1
17	HARRIS	UBD	CO	001	<1
18	PETROLIA	UBD	CO	004	<1
19	SHIVELY	UBD	CO	004	<1
20	CITY GARBAGE CO	UBD	PVT	040	0065
(53) TRINITY					
01	BIG BAR	UBD	CO	002	<1
02	BURNT RANCH	UBD	CO	005	<1
03	DEDRICK	UBD	CO	001	<1
04	DOUGLAS CITY	UBD	CO	008	<1
05	CARRVILLE	UBD	CO	005	<1
06	DENNY	UBD	CO	002	<1
07	HAYFORK	SDB	CO	004	0002
08	FOREST GLEN	UBD	CO	009	<1
09	HYAMPOM	UBD	CO	004	<1
10	JUNCTION CITY	UBD	CO	005	<1
11	LEWISTON	UBD	PVT	040	0001
12	MAD RIVER VAN DUZEN	UBD	CO	004	0001
13	RUTH	UBD	CO	005	<1
14	WEAVERVILLE	UBD	CO	010	0004
15	WILDWOOD	UBD	PVT	005	<1
16	TRINITY CENTER	UBD	CO	001	0001

1/Explanation of type of site may be found in Chapter VI, pages 16-22.
2/Co - County; Pvt - Private; Fed - Federal; Dist - District.
3/Daily tonnage represents year total divided by 365.


SUBMAP "A"
LEGEND ON INDEX MAP
OREGON
PACIFIC OCEAN
CRESCENT CITY
EUREKA
WEAVERVILLE
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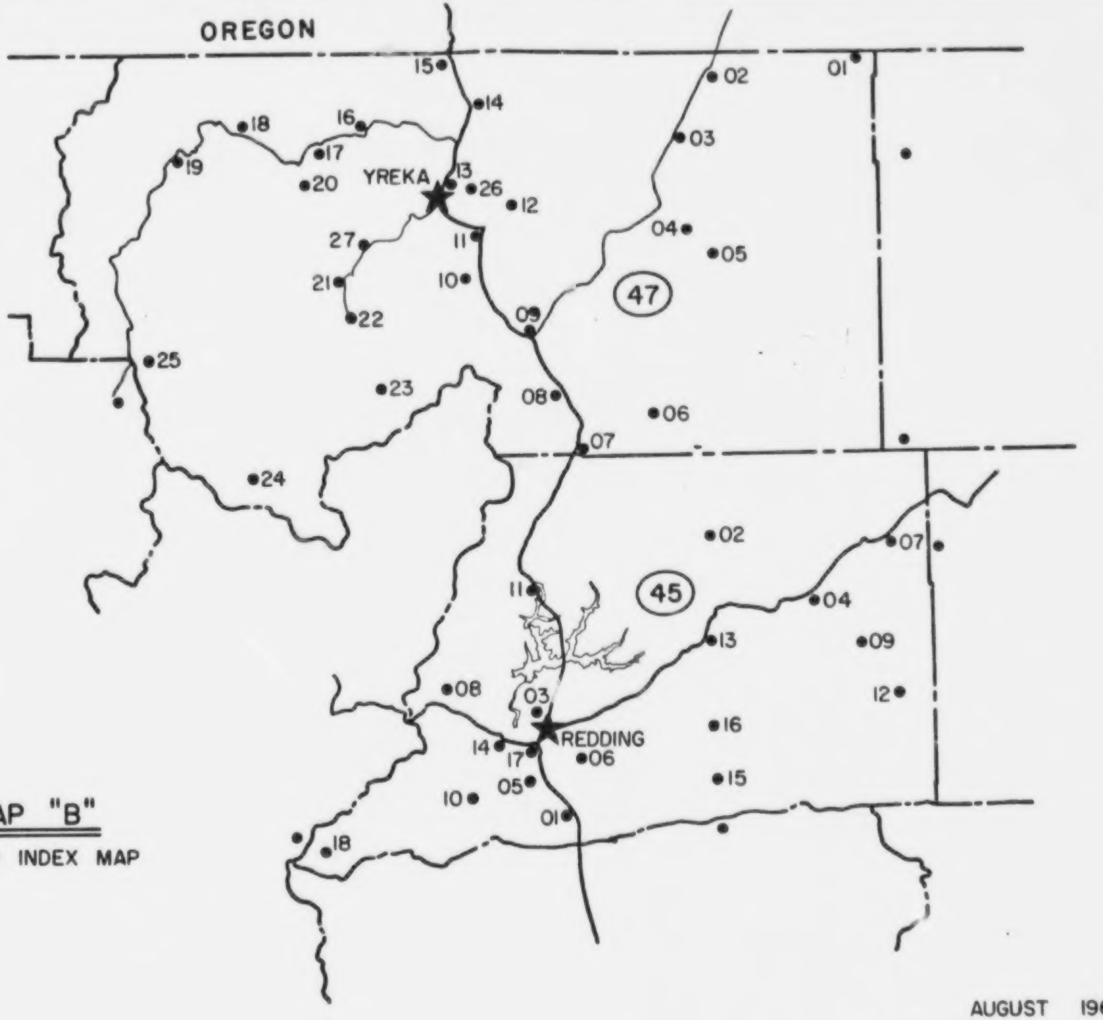
AUGUST 1968
CALIF. DEPT. OF PUBLIC HEALTH

SOLID WASTE DISPOSAL SITES

Site Code	Site Name	Type of Site	Oper-ator	Total Acreage	Daily Tonnage
㊺ SHASTA					
01	ANDERSON	SDB	CO	160	0020
02	BIG BEND	UBD	CO	008	0001
03	BUCKEYE	SDB	CO	005	0025
04	BURNEY	UBD	CO	003	0006
05	CLEAR CREEK	UBD	CO	040	0010
06	ENTERPRISE	SDB	CO	040	0040
07	FALL RIVER MILLS	UBD	CO	040	0002
08	FRENCH GULCH	UBD	CO	002	<1
09	HAT CREEK	UBD	CO	003	<1
10	IGO - ONO	SDB	CO	040	0001
11	LAKEHEAD	UBD	CO	005	0003
12	OLD STATION	UBD	CO	010	<1
13	ROUND MOUNTAIN	UBD	CO	008	<1
14	SHASTA	UBD	CO	005	<1
15	SHINGLETOWN	UBD	CO	080	<1
16	WHITMORE	UBD	CO	005	<1
17	REDDING	MSLB	CITY	416	0060
18	HARRISON GULCH	UBD	FED	001	<1
㊼ SISKIYOU					
01	TULE LAKE	UBD	CO	010	0005
02	DORRIS	UBD	CITY	007	0003
03	MACDOEL	UBD	CO	010	<1
04	BRAY	UBD	CO	002	<1
05	TENNANT	UBD	CO	002	<1
06	MCCLOUD	SDB	DIST	010	0004
07	DUNSMUIR	UBD	CITY	002	0001
08	MT SHASTA	UBD	CITY	040	0010
09	WEED	SDB	CITY	007	0020
10	GAZELLE	UBD	CO	005	0001
11	GRENADA	UBD	CO	040	0003
12	LITTLE SHASTA	UBD	CO	003	0001
13	YREKA	SDB	CITY	330	0010
14	HORNBROOK	UBD	CO	010	0001
15	HILT	UBD	PVT	005	0001
16	OAK KNOLL	UBD	FED	002	<1
17	HORSE CREEK	UBD	CO	005	<1
18	SEIAD	UBD	CO	002	0001
19	HAPPY CAMP	UBD	CO	010	0002
20	SCOTT BAR	UBD	FED	001	<1
21	GREENVIEW	UBD	CO	002	<1
22	ETNA	UBD	CITY	002	0001
23	CALLAHAN	UBD	CO	002	<1
24	CECILVILLE	UBD	CO	002	<1
25	OAK BOTTOM	UBD	FED	002	<1
26	MONTAGUE	UBD	CITY	005	0001
27	FORT JONES	UBD	CITY	003	<1



OREGON
YREKA
REDDING
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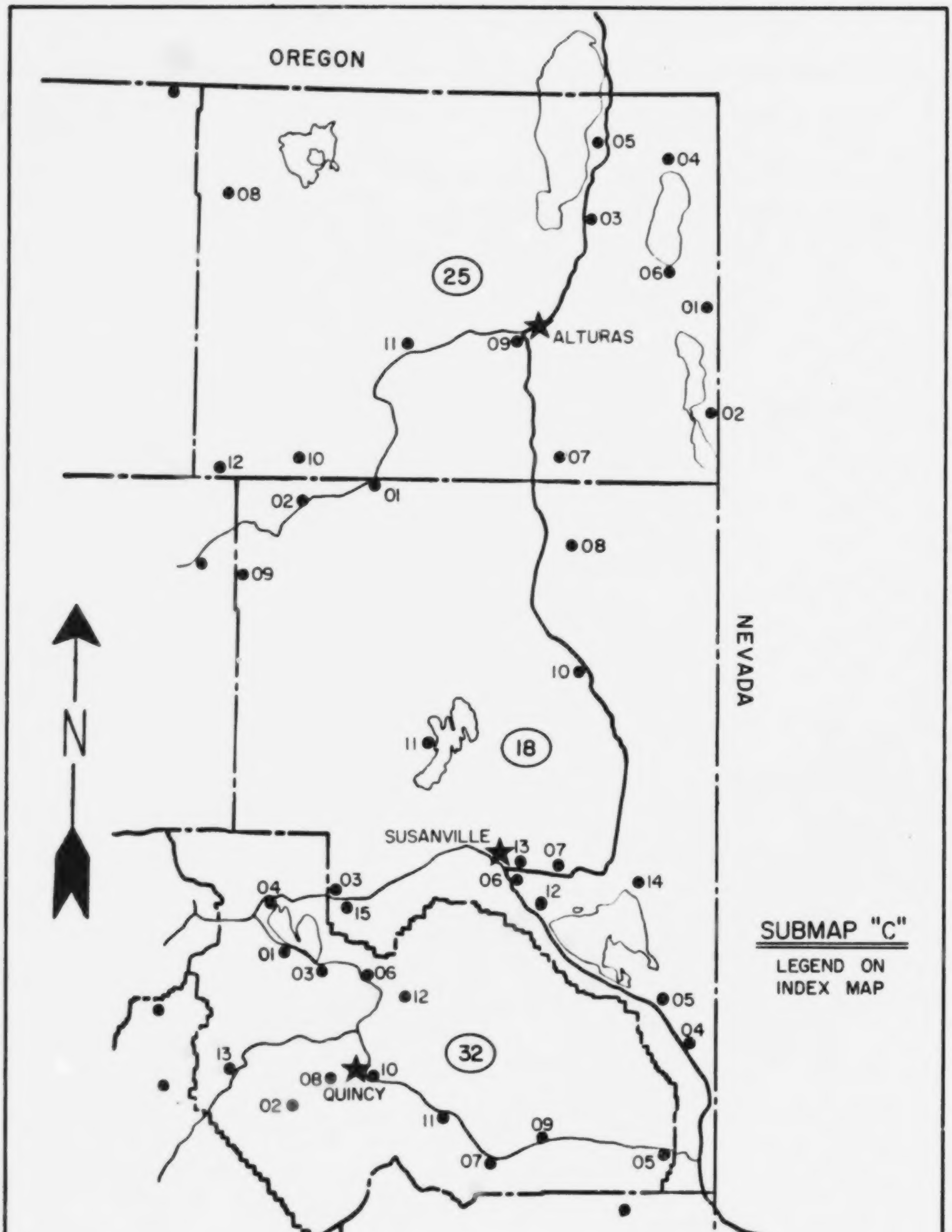
SUBMAP "B"

LEGEND ON INDEX MAP

AUGUST 1968
CALIF. DEPT. OF PUBLIC HEALTH

SOLID WASTE DISPOSAL SITES

Site Code	Site Name	Type of Site	Operator	Total Acreage	Daily Tonnage
⑱ LASSEN					
01	ADIN	UBD	CO	008	<1
02	BIEBER	UBD	CO	017	<1
03	CLEAR CREEK	UBD	CO	003	<1
04	DOYLE	UBD	CO	050	<1
05	HERLONG COUNTY	UBD	CO	-	0001
06	JOHNSTONVILLE	UBD	CO	008	<1
07	LITCHFIELD	UBD	CO	010	<1
08	MADELINE	UBD	CO	005	<1
09	PITTVILLE	UBD	CO	006	<1
10	RAVENDALE	UBD	CO	005	<1
11	SPAULDING	UBD	CO	003	<1
12	SUNNYSIDE	UBD	CO	004	<1
13	SUSANVILLE	SDB	CITY	020	0005
14	WENDEL	UBD	CO	008	<1
15	WESTWOOD	UBD	CO	006	<1
㉕ MODOC					
01	CEDARVILLE	UBD	CO	640	0001
02	EAGLEVILLE	UBD	CO	025	<1
03	DAVIS CREEK	UBD	CO	015	<1
04	FORT BIDWELL	UBD	CO	005	<1
05	WILLOW RANCH	UBD	CO	005	<1
06	LAKE CITY	UBD	CO	022	<1
07	LIKELY	UBD	CO	022	<1
08	NEWELL	UBD	CO	006	<1
09	ALTURAS	UBD	CITY	040	0003
10	LOOKOUT	UBD	CO	006	<1
11	CANBY	UBD	CO	005	<1
12	DAY	UBD	CO	003	<1
㉜ PLUMAS					
01	ALMANOR	UBD	PVT	005	0001
02	BUCKS LAKE	UBD	CO	004	<1
03	CANYONDAM	UBD	CO	011	0001
04	CHESTER	UBD	CO	015	0004
05	CHILCOOT	UBD	CO	037	0001
06	GREENVILLE	UBD	CO	004	0004
07	GRAEAGLE	UBD	PVT	005	<1
08	MEADOW VALLEY	UBD	PVT	-	0001
09	PORTOLA	UBD	CO	010	0002
10	QUINCY	UBD	CO	040	0008
11	SLOAT	UBD	CO	005	0001
12	TAYLORSVILLE	UBD	CO	011	<1
13	TOBIN	UBD	CO	003	<1


OREGON
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ALTURAS
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NEVADA
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SUSANVILLE
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QUINCY
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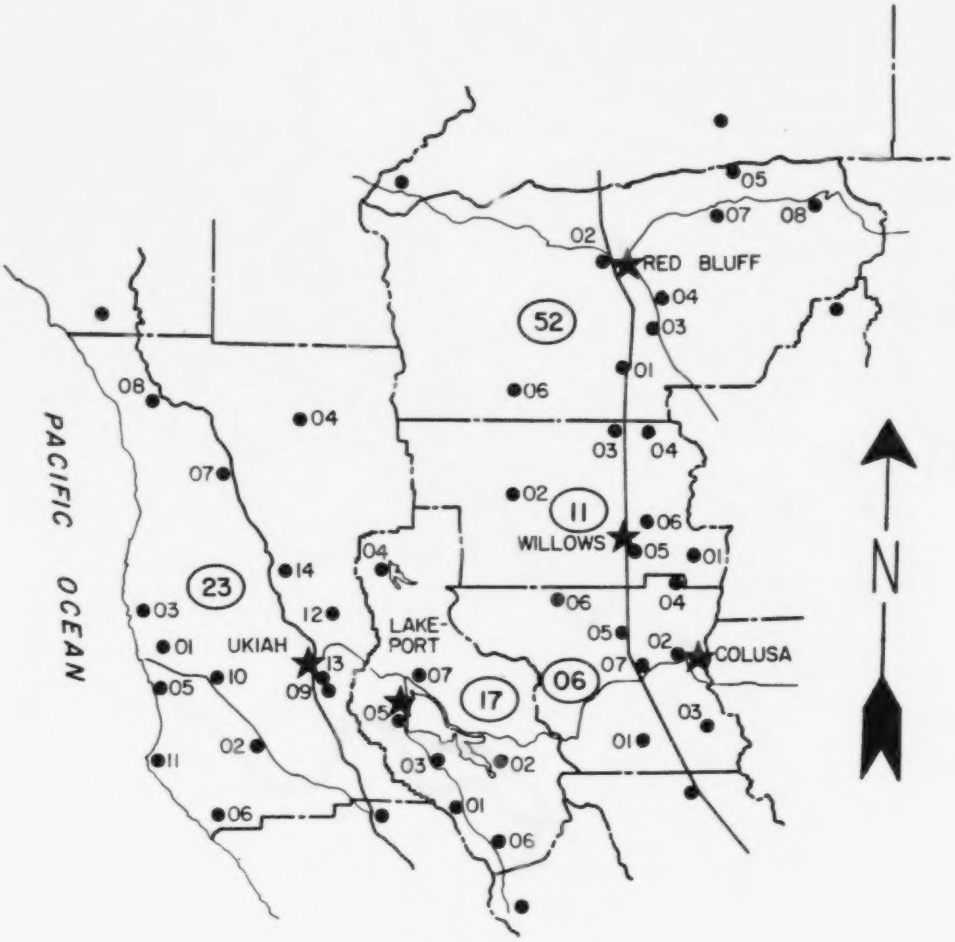
SUBMAP "C"
LEGEND ON INDEX MAP
AUGUST 1968
CALIF. DEPT. OF PUBLIC HEALTH

SOLID WASTE DISPOSAL SITES

Site Code	Site Name	Type of Site	Operator	Total Acreage	Daily Tonnage
(06)	**COLUSA**				
01	ARBUCKLE	UBD	CO	010	0002
02	COLUSA	UBD	CO	004	0015
03	GRIMES	UBD	CO	002	<1
04	PRINCETON	UBD	CO	005	<1
05	MAXWELL	UBD	CO	010	0001
06	STONYFORD	UBD	FED	005	<1
07	WILLIAMS	UBD	CITY	012	0003
(11)	**GLENN**				
01	BUTTE CITY	UBD	CO	010	0001
02	ELK CREEK	UBD	CO	005	0001
03	ORLAND CITY	SDB	PVT	040	0004
04	ORLAND COUNTY	SDB	CO	040	0002
05	WILLOWS CITY	UBD	CITY	003	0002
06	WILLOWS COUNTY	SDB	CO	020	0002
(17)	**LAKE**				
01	COBB MOUNTAIN	UBD	CO	015	0002
02	HIGHLANDS	SDB	CO	056	0010
03	KELSEYVILLE	SDB	CO	018	0005
04	LAKE PILLSBURY	UBD	FED	002	<1
05	LAKEPORT	SDB	CO	022	0008
06	MIDDLETOWN	SDB	CO	024	0005
07	NICE	SDB	CO	012	0005
(23)	**MENDOCINO**				
01	ALBION	UBD	CO	015	0001
02	BOONVILLE	UBD	CO	010	0002
03	CASPER	SDB	CITY	060	0012
04	COVELO	UBD	CO	010	0003
05	ELK	UBD	CO	005	<1
06	GUALALA	UBD	CO	007	0001
07	LAYTONVILLE	UBD	CO	034	0001
08	LEGGETT	UBD	CO	010	<1
09	MENDOCINO STATE HOS	MSLB	STATE	005	0005
10	NAVARRO	UBD	CO	001	<1
11	POINT ARENA	UBD	CITY	001	0001
12	POTTER VALLEY	UBD	CO	006	0001
13	UKIAH	MSLB	PVT	300	0025
14	WILLITS	UBD	PVT	002	0006
(52)	**TEHEMA**				
01	CORNING	SDB	CITY	010	0010
02	RED BLUFF	UBD	CO	080	0015
03	TEHAMA	UBD	CO	010	0001
04	DYE CREEK	UBD	CO	007	0001
05	MANTON	UBD	CO	040	0001
06	PASKENTA	UBD	CO	005	<1
07	PAYNES CREEK	UBD	CO	020	<1
08	MINERAL	UBD	CO	008	<1



RED BLUFF
52
WILLOWS
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COLUSA
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UKIAH
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LAKE-PORT
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PACIFIC OCEAN
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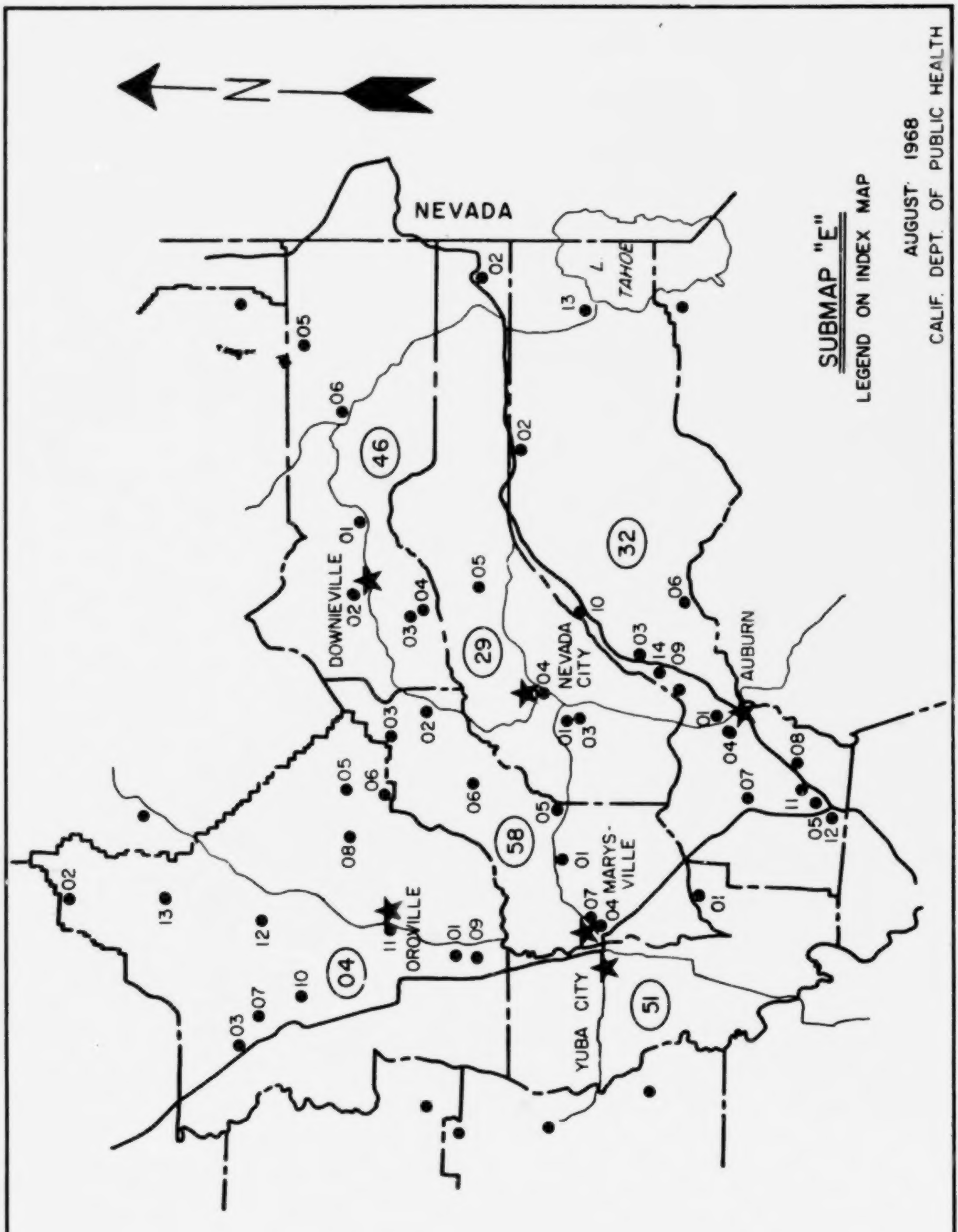
SUBMAP "D"

LEGEND ON INDEX MAP

AUGUST 1968
CALIF. DEPT. OF PUBLIC HEALTH

SOLID WASTE DISPOSAL SITES

Site Code	Site Name	Type of Site	Oper-ator	Total Acreage	Daily Tonnage
(04) BUTTE					
01	BIGGS GRIDLEY	SDB	PVT	012	0004
02	BUTTE MEADOWS	UBD	CO	005	<1
03	CHICO AIRPORT	OTHER	CITY	020	<1
05	FEATHER FALLS	UBD	PVT	003	<1
06	FORBESTOWN	UBD	CO	002	<1
07	JOHNSON	UBD	PVT	015	0002
08	LAKE MADRONE	UBD	CO	002	<1
09	MATHEWS RANCH	UBD	PVT	003	0010
10	NEIL ROAD	SDB	PVT	070	0040
11	OROVILLE	UBD	CO	010	0025
12	PARIDISE CLARK ROAD	SDB	PVT	010	0010
13	STIRLING CITY	UBD	CO	002	<1
(29) NEVADA					
01	GRASS VALLEY DISPOSAL	SDB	PVT	456	0012
02	HIRSCHDALE	SDB	PVT	016	0005
03	MCCOURTNEY RD	SDB	PVT	060	0004
04	NEVADA CITY	UBD	CITY	-	0004
05	WASHINGTON	UBD	CO	003	<1
(32) PLACER					
01	AUBURN	MSL	PVT	040	0025
02	BIG BEND	UBD	PVT	005	<1
03	COLFAX	SDB	CITY	020	0005
04	DE WITT STATE HOSPITAL	SDB	STATE	001	0001
05	FINGERS	SDB	PVT	026	0005
06	FORESTHILL	MSL	PVT	030	0001
07	LINCOLN	SDB	CITY	013	0005
08	LOOMIS	MSLB	PVT	037	0009
09	MEADOW VISTA	SDB	PVT	017	0005
10	MONTE VISTA	SDB	PVT	012	0004
11	ROCKLIN	SDB	CITY	005	0003
12	SAUGSTAD PARK	MSL	CITY	017	0035
13	TAHOE CITY	MSL	PVT	080	0012
14	WEIMAR MEDICAL FACIL	SDB	CO	002	0002
(46) SIERRA					
01	SIERRA CITY	UBD	CO	002	<1
02	FIRST DIVIDE	UBD	CO	005	0001
03	FOREST	UBD	CO	001	<1
04	ALLEGANY	UBD	CO	001	<1
05	LOYALTON	UBD	CITY	002	0002
06	SATLEY SIERRAVILLE	UBD	CO	003	<1
(51) SUTTER					
01	BEAR RIVER	UBD	CO	002	0001
(58) YUBA					
01	BROWNS VALLEY	UBD	CO	024	0002
02	CAMPTONVILLE	UBD	CO	001	<1
03	CLIPPER MILLS DUMP	UBD	CO	005	<1
04	MAROGNA	MSLB	PVT	160	0015
05	SMARTVILLE	UBD	CO	005	<1
06	TEXAS HILL	UBD	CO	005	0001
07	YUBA SUTTER SCAV CO	MSLB	PVT	020	0100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NEVADA
L. TAHOE
DOWNIEVILLE
NEVADA CITY
AUBURN
OROVILLE
MARYS-VILLE
YUBA CITY
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SUBMAP "E"

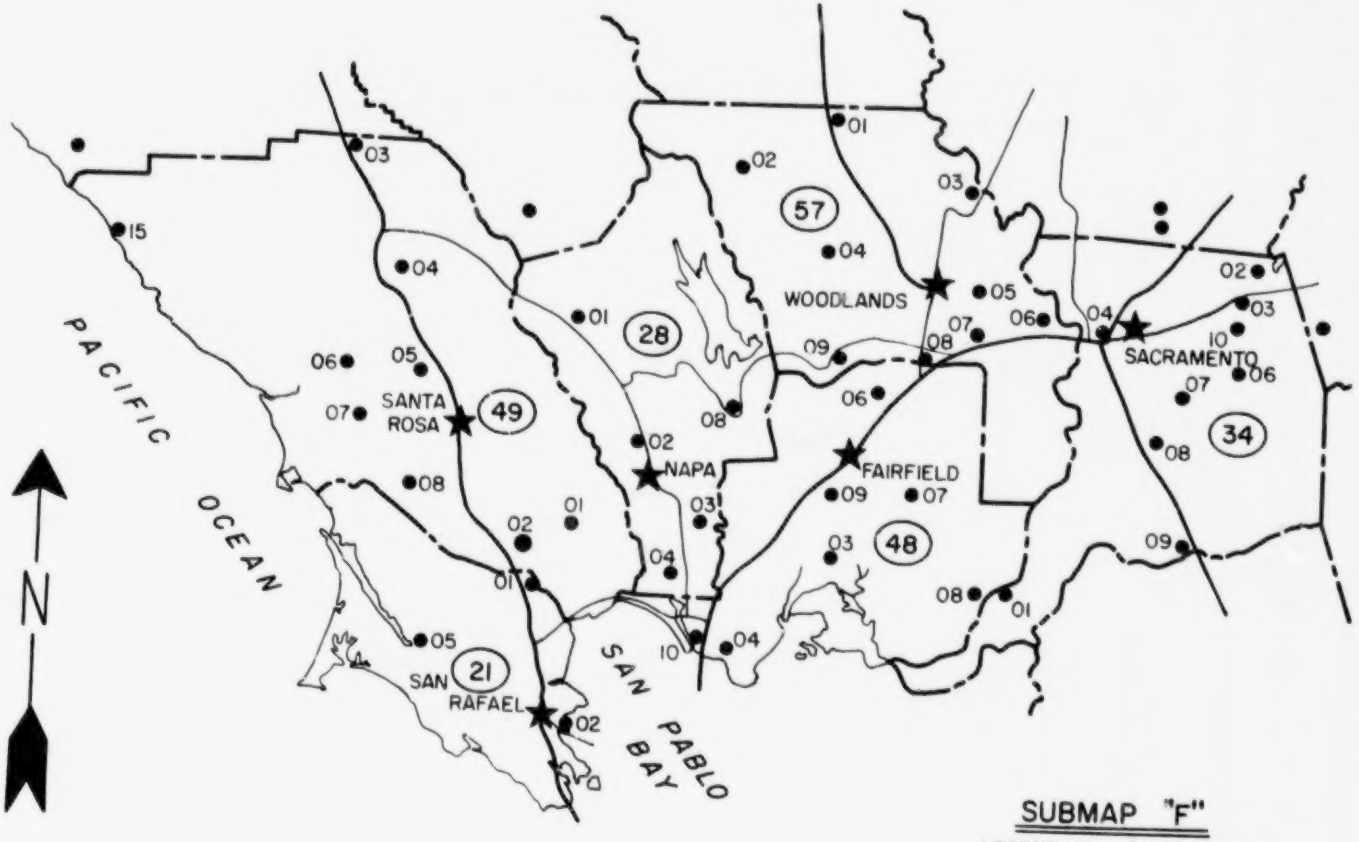
LEGEND ON INDEX MAP

AUGUST 1968

CALIF. DEPT. OF PUBLIC HEALTH

SOLID WASTE DISPOSAL SITES

Site Code	Site Name	Type of Site	Operator	Total Acreage	Daily Tonnage
㉑	**MARIN**				
01	REDWOOD	SL	PVT	600	0135
02	SAN QUENTIN	MSL	PVT	034	0060
05	MARTINELLI	MSL	PVT	025	0005
㉘	**NAPA**				
01	UPPER VALLEY	MSLB	PVT	055	0010
02	YOUNTVILLE VETS HOME	SDB	STATE	009	0013
03	NAPA STATE HOSPITAL	UBD	STATE	002	0002
04	AMERICAN CANYON	SDB	PVT	396	0090
08	DEL SANTI	UBD	PVT	005	0001
㉞	**SACRAMENTO**				
01	ISLETON	UBD	CITY	002	0002
02	FOLSOM PRISON	SDB	STATE	001	0005
03	AEROJET GENERAL	MSL	PVT	150	0010
04	SACRAMENTO CITY	SL	CITY	030	0753
06	SACRAMENTO COUNTY 1	SL	CO	655	0265
07	GERBER ROAD	MSL	PVT	160	0110
08	ELK GROVE	MSL	PVT	022	0013
09	GALT	UBD	CITY	003	0002
10	WHITE ROCK	MSL	PVT	400	0048
㊽	**SOLANO**				
03	FAIRFIELD	MSLB	PVT	070	0046
04	SOLANO COUNTY	MSLB	PVT	127	0025
06	DIXON	MSLB	CITY	035	0015
07	B&J	MSLB	PVT	162	0060
08	RIO VISTA	MSLB	CITY	021	0012
09	CALIF MEDICAL FACILITY	SDB	STATE	003	0003
10	EVERS	MSL	PVT	005	0010
㊾	**SONOMA**				
01	SONOMA	MSLB	CO	028	0093
02	PETALUMA CITY DUMP	SDB	CITY	021	0003
03	CLOVERDALE	SDB	CO	006	0007
04	HEALDSBURG	SDB	CO	004	0053
05	WINDSOR	MSLB	CO	022	0173
06	GUERNEVILLE	SDB	CO	090	0035
07	OCCIDENTAL	SDB	CO	002	0020
08	ROBLAR	MSL	CO	078	0040
15	SEA RANCH	MSLB	PVT	002	<1
(57)	**YOLO**				
01	DUNNIGAN	UBD	CO	010	<1
02	GUINDA	UBD	CO	013	<1
03	KNIGHTS LANDING	UBD	CO	004	0001
04	ESPARTO	UBD	CO	010	0002
05	WOODLAND	SDB	PVT	160	0030
06	ALBERICCI	SDB	PVT	010	0020
07	DAVIS	SDB	CITY	010	0025
08	UNIV OF CALIF - DAVIS	SL	STATE	028	0015
09	WINTERS	SDB	CITY	030	0010


PACIFIC OCEAN
SAN PABLO BAY
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SANTA ROSA
NAPA
WOODLANDS
FAIRFIELD
SACRAMENTO
SAN RAFAEL
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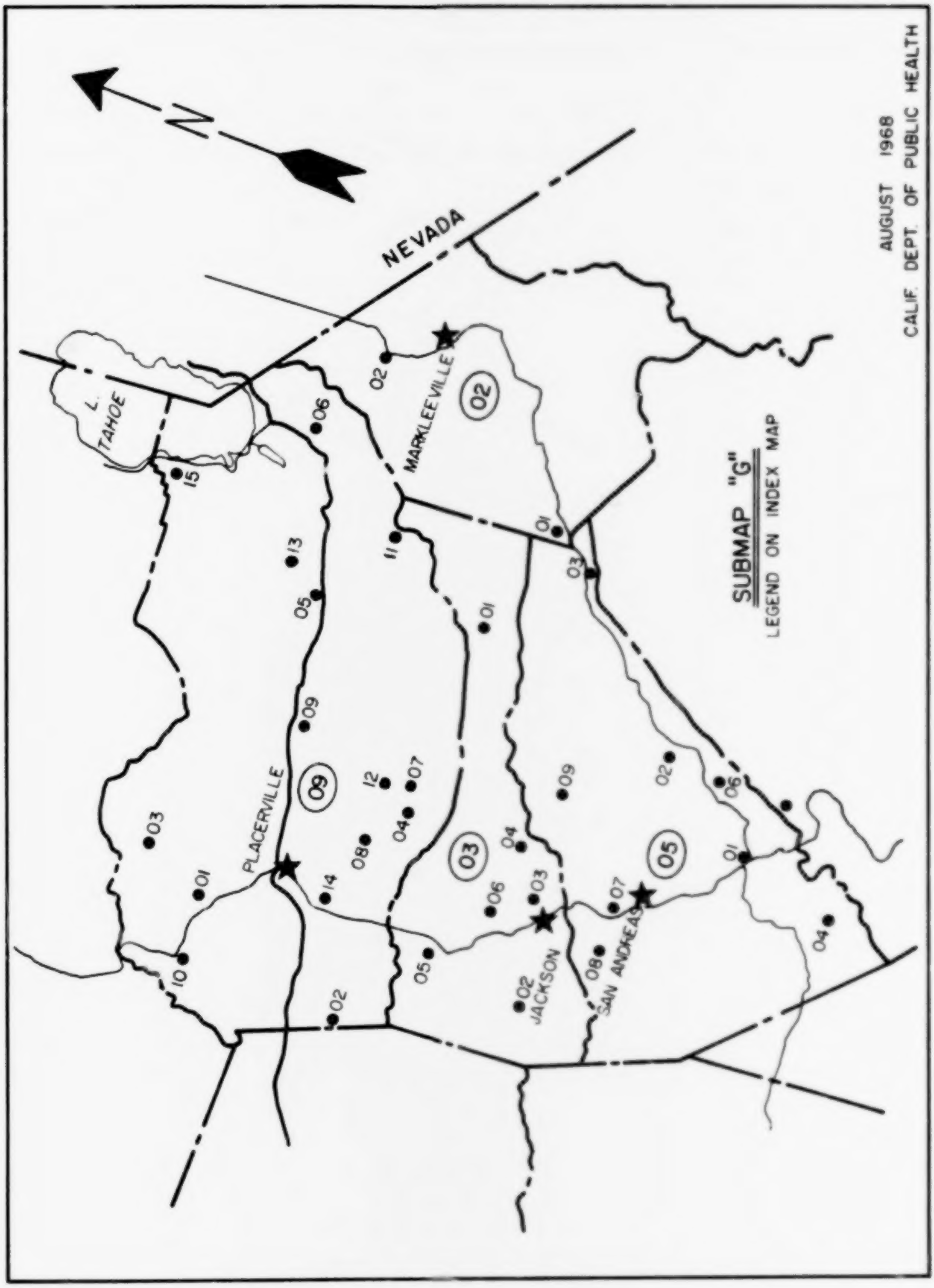
SUBMAP "F"
LEGEND ON INDEX MAP

AUGUST 1968
CALIF. DEPT. OF PUBLIC HEALTH

SOLID WASTE DISPOSAL SITES

Site Code	Site Name	Type of Site	Operator	Total Acreage	Daily Tonnage
(02)	**ALPINE**				
01	ALPINE	UBD	FED	005	0001
02	WOODFORDS	MSLB	PVT	020	0001
(03)	**AMADOR**				
01	BEAR LAKE	UBD	FED	003	<1
02	IONE	UBD	CO	-	0004
03	JACKSON	UBD	CO	004	0005
04	PINE GROVE	UBD	CO	002	<1
05	PLYMOUTH	UBD	CO	003	<1
06	SUTTER CREEK	UBD	CO	002	0004
(05)	**CALAVARAS**				
01	ANGELS CAMP	UBD	CO	003	0004
02	AVERY	UBD	CO	003	0002
03	BIG MEADOWS	UBD	FED	002	<1
04	COPPEROPLIS	UBD	CO	005	<1
06	MURPHYS	UBD	CO	014	0002
07	SAN ANDREAS	UBD	CO	003	0003
08	VALLEY SPRINGS	UBD	CO	007	0001
09	WILSEYVILLE	UBD	CO	010	0002
(09)	**EL DORADO**				
01	COLOMA LOTUS	UBD	PVT	010	0002
02	EL DORADO HILLS	UBD	CO	050	<1
03	GEORGETOWN	SDB	CO	003	0004
04	GREENWOOD	UBD	CO	004	<1
05	KYBURZ	UBD	FED	006	0001
06	MEYERS	MSLB	PVT	007	0035
07	OMO RANCH	UBD	PVT	005	0005
08	OUTINGDALE	SDB	CO	010	0003
09	PARK CREEK	SDB	CO	010	0001
10	PILOT HILL	UBD	CO	010	0001
11	SILVER LAKE	UBD	CO	004	<1
12	WILLOW	UBD	CO	004	<1
13	WRIGHTS LAKE	UBD	FED	003	<1
14	UNION MINE	SDB	CO	217	0015
15	MEEKS BAY	UBD	PVT	004	<1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NEVADA
L. TAHOE
MARKLEEVILLE
PLACERVILLE
JACKSON
SAN ANDREAS
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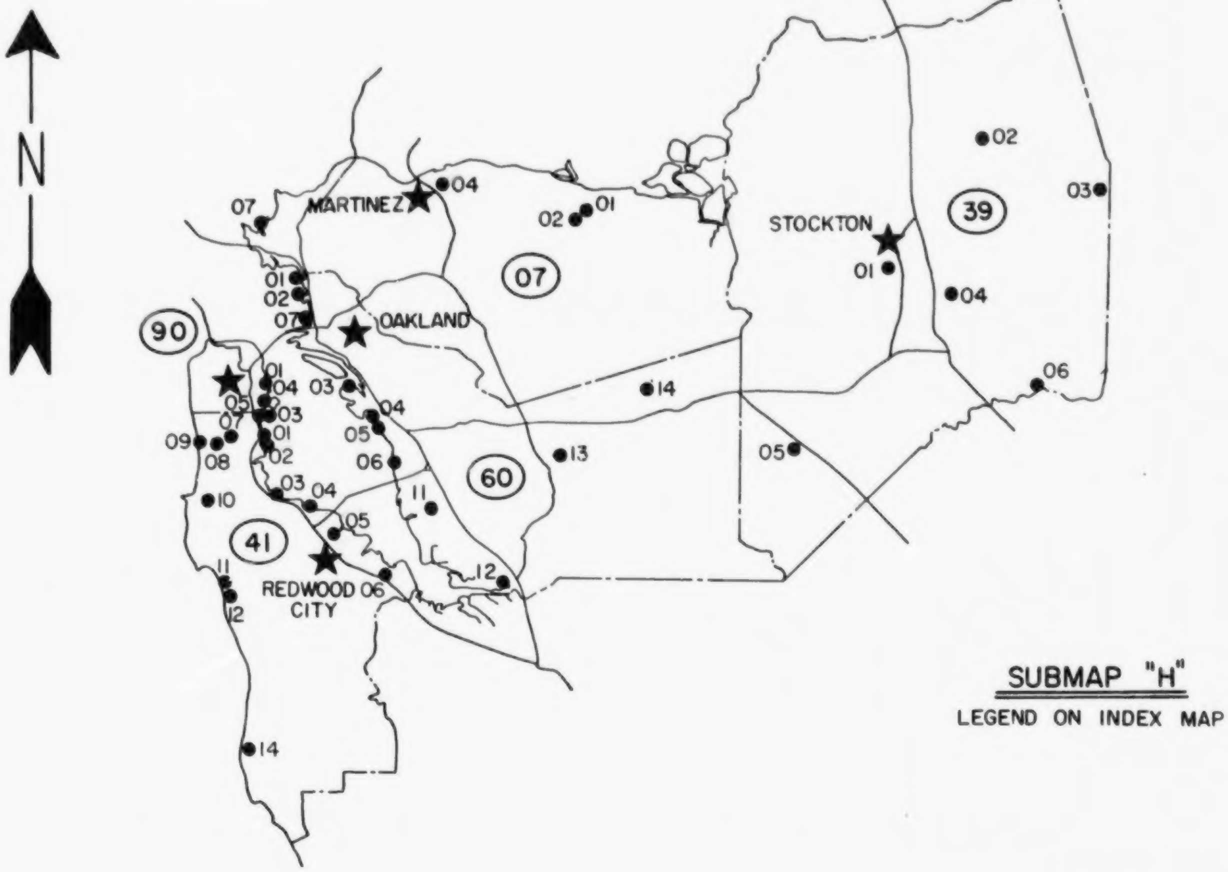
SUBMAP "G"

LEGEND ON INDEX MAP

AUGUST 1968
CALIF. DEPT. OF PUBLIC HEALTH

SOLID WASTE DISPOSAL SITES

Site Code	Site Name	Type of Site	Operator	Total Acreage	Daily Tonnage
(07) CONTRA COSTA					
01	PITTSBURG	MSL	PVT	025	0105
02	ANTIOCH	MSL	PVT	016	0110
04	ACME FILL	MSL	PVT	449	0430
07	WEST CONTRA COSTA CO	MSL	PVT	900	0880
(39) SAN JOAQUIN					
01	FRENCH CAMP	MSLB	PVT	051	0085
02	HARNY LANE	MSLB	CITY	110	0127
03	FOOTHILL	MSL	PVT	800	0057
04	AUSTIN RD	MSL	PVT	172	0133
05	CORRAL HOLLOW	MSLB	CITY	043	0060
06	ESCALON	UBD	PVT	005	0003
(41) SAN MATEO					
01	SANITARY FILL CO	MSL	PVT	100	1600
02	SOUTH SAN FRANCISCO	MSL	PVT	100	0280
03	BURLINGAME RUBBISH	MSL	PVT	090	0100
04	SAN MATEO RUBBISH	SL	PVT	032	0100
05	SAN MATEO SCAV CO	MSL	PVT	146	0400
06	S COUNTY DISPOSAL DIST	MSL	DIST	064	0200
07	HILLSIDE	MSL	PVT	-	0010
08	COLMA RUBBISH	MSL	PVT	005	0015
09	DALY CITY	MSL	PVT	043	0079
10	PACIFICA	SL	PVT	035	0060
11	HALF MOON BAY	MSL	PVT	006	0001
12	HALF MOON BAY RUBBISH	MSL	PVT	005	0003
14	PESCADERO	MSL	PVT	003	0005
(60) ALAMEDA					
01	ALBANY	MSL	PVT	135	0165
02	BERKELEY	MSL	CITY	050	0095
03	ALAMEDA	MSL	PVT	029	0225
04	DAVIS ST - OAK SCAV	MSL	PVT	240	0975
05	SAN LEANDRO MARINA	MSL	PVT	150	0060
06	WEST WINTON - OAK SCAV	MSL	PVT	700	0400
07	FIBREBOARD-EMERYVILLE	OTHER	PVT	134	0100
11	TURK ISLAND CO	MSL	PVT	137	0025
12	DURHAM ROAD - OAK SCAV	MSL	PVT	385	0250
13	EASTERN ALAMEDA COUNTY	MSL	PVT	305	0050
14	PLEASANTON	MSL	PVT	040	0030
(90) SAN FRANCISCO					
01	ISLAIS CREEK	MSL	PVT	155	0900
03	LEONETTI	MSL	PVT	004	0010
04	FLORA CRANE	MSL	PVT	004	0065
05	MIRZA	MSL	PVT	003	0050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MARTINEZ
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STOCKTON
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OAKLAND
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REDWOOD CITY
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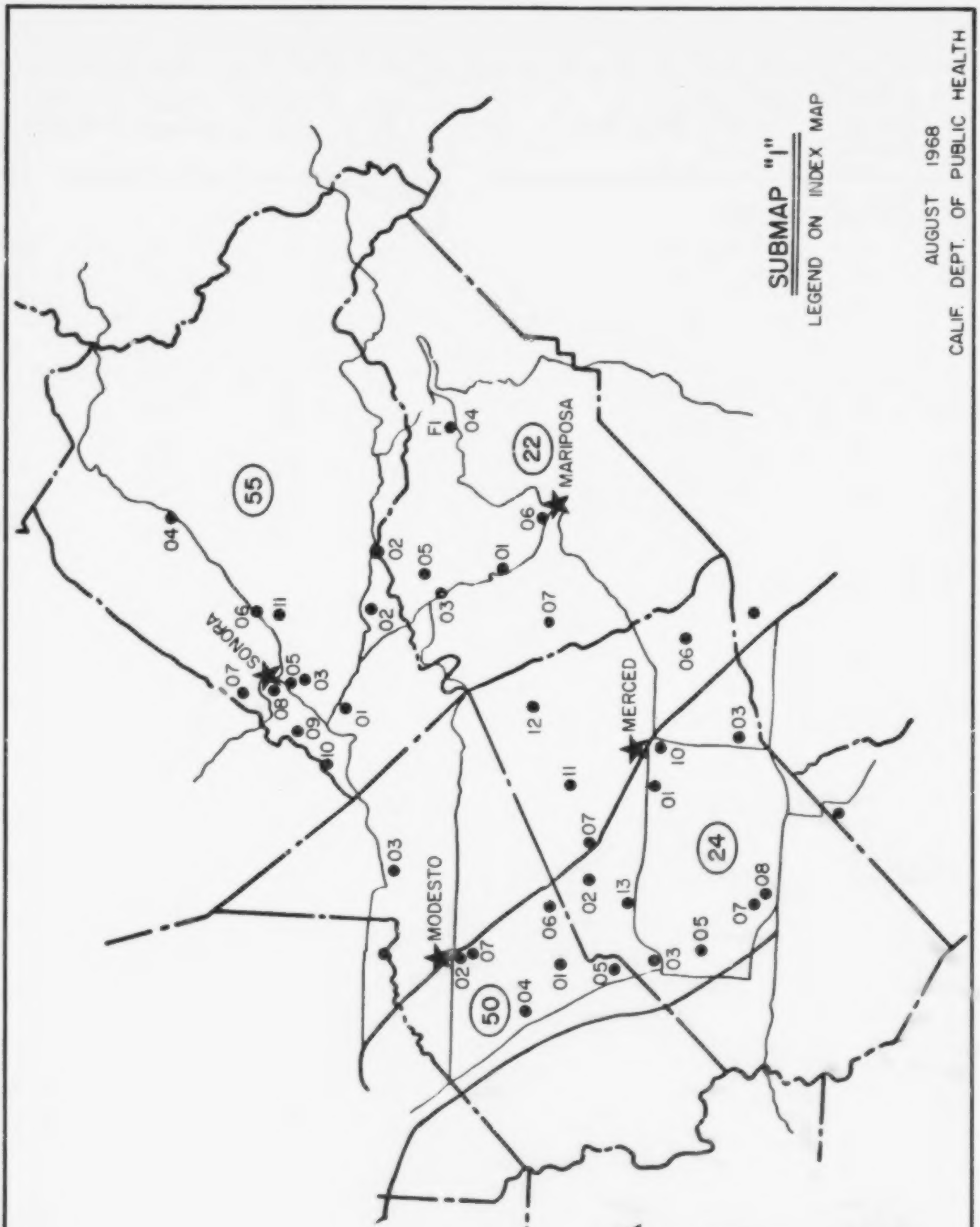
SUBMAP "H"

LEGEND ON INDEX MAP

AUGUST 1968
CALIF. DEPT. OF PUBLIC HEALTH

SOLID WASTE DISPOSAL SITES

Site Code	Site Name	Type of Site	Operator	Total Acreage	Daily Tonnage
㉒ **MARIPOSA**					
01	BEAR VALLEY	UBD	CO	030	0001
02	BUCK MEADOW	UBD	CO	004	0001
03	COULTERVILLE	UBD	CO	003	<1
04	EL PORTAL	SDB	FED	005	0004
05	GREELY HILL	UBD	CO	004	<1
06	MARIPOSA	UBD	CO	060	0003
07	HORNITOS	UBD	CO	002	<1
㉔ **MERCED**					
01	ATWATER	MSLB	CITY	100	0010
02	DELHI HILMAR	UBD	CO	005	0001
03	EL NIDO	UBD	CO	004	<1
04	GUSTINE	UBD	CITY	010	0002
05	INGOMAR	UBD	CO	020	0001
06	LE GRAND	UBD	CO	003	0001
07	LIVINGSTON	SDB	CITY	003	0010
08	LOS BANOS CITY	UBD	CITY	050	0015
09	LOS BANOS COUNTY	UBD	CO	037	0002
10	MERCED	SDB	CITY	100	0055
11	SHAFFER	UBD	CO	018	0030
12	SNELLING	UBD	CO	070	<1
13	STEVINSON	UBD	CO	010	0001
㊿ **STANISLAUS**					
01	GREER RANCH	UBD	PVT	030	0012
02	MODESTO	MSL	PVT	035	0125
03	OAKDALE	MSL	PVT	017	0015
04	PATTERSON	UBD	CITY	006	0005
05	NEWMAN	UBD	CITY	002	0002
06	TURLOCK	UBD	CITY	020	0005
07	BONZI	MSL	PVT	041	0140
(55) **TUOLUMNE**					
01	CHINESE CAMP	UBD	CO	003	0001
02	GROVELAND	UBD	CO	010	<1
03	JAMESTOWN	SDB	CO	002	0001
04	PINECREST	UBD	CO	030	0001
05	SONORA	SDB	CITY	025	0002
06	TWAINE HARTE	SDB	CO	040	0004
07	COLUMBIA	SDB	CO	005	<1
08	ROTELLI	SDB	PVT	005	0004
09	SIERRA CONSERVATION C	SDB	STATE	-	0001
10	TULLOCH RESORT	UBD	CO	003	<1
11	TOOLUMNE	SDB	CO	002	0003


SUBMAP "I"
LEGEND ON INDEX MAP
AUGUST 1968
CALIF. DEPT. OF PUBLIC HEALTH
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SONORA
MARIPOSA
MERCED
MODESTO
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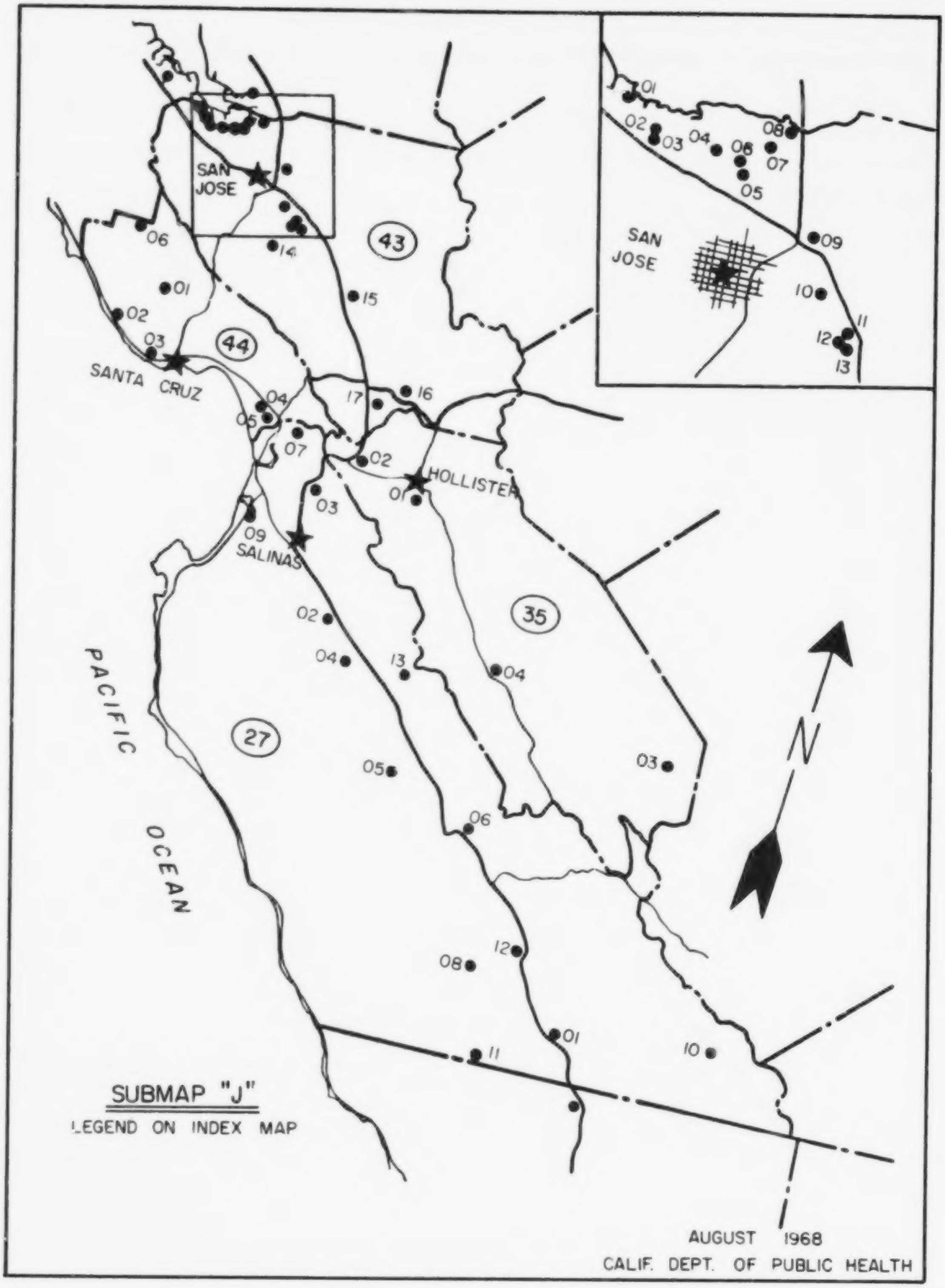
SOLID WASTE DISPOSAL SITES

Site Code	Site Name	Type of Site	Operator	Total Acreage	Daily Tonnage
㉗ MONTEREY					
01	BRADLEY	UBD	CO	005	<1
02	CHUALAR ROAD	SDB	CO	019	0013
03	CRAZY HORSE	MSLB	PVT	135	0125
04	GONZALES	UBD	CITY	015	0005
05	GREENFIELD	SDB	CO	010	0001
06	KING CITY	UBD	CITY	015	0002
07	LEWIS ROAD	SDB	CO	028	0006
08	LOCKWOOD	UBD	CO	005	<1
09	MONTEREY PENINSULA	SL	DIST	550	0200
10	PARKFIELD	UBD	CO	005	<1
11	SAN ANTONIO LAKE REC	MSL	CO	018	<1
12	SAN ARDO	UBD	CO	005	<1
13	SOLEDAD	SL	PVT	130	0008
㉟ SAN BENITO					
01	HOLLISTER	SDB	CITY	065	0015
02	SAN JUAN BAUTISTA	SDB	PVT	006	0002
03	NEW IDRIA	UBD	PVT	001	<1
04	PINNACLES	MSL	FED	005	<1
㊸ SANTA CLARA					
01	PALO ALTO	MSL	CITY	170	0140
02	MOUNTAIN VIEW	MSL	PVT	055	0090
03	STIERLIN ROAD	MSL	PVT	027	0080
04	SUNNYVALE	MSL	PVT	095	0250
05	SANTA CLARA	MSL	CITY	073	0070
06	EDGEWATER	MSL	PVT	040	0200
07	LOS ALTOS RANCH	MSL	PVT	114	0300
08	NEWBY ISLAND	MSL	PVT	342	0500
09	CUSTOMER UTILITY	MSL	PVT	009	0055
10	STORY ROAD	MSL	PVT	090	0160
11	SINGLETON ROAD	SL	PVT	015	0040
12	SAN JOSE	SL	CITY	005	0150
13	EASTSIDE	MSL	PVT	014	0100
14	GUADALUPE	SL	PVT	026	0370
15	MORGAN HILL	MSL	PVT	050	0010
16	PACHECO PASS	SL	PVT	075	0010
17	GILROY	MSL	PVT	100	0010
㊹ SANTA CRUZ					
01	BEN LOMOND	MSL	PVT	019	0005
02	DAVENPORT	UBD	PVT	001	0001
03	SANTA CRUZ	SDB	CITY	100	0100
04	BUENA VISTA	MSL	CO	100	0030
05	WATSONVILLE	MSL	CITY	010	0060
06	SANTA CRUZ LUMBER CO	UBD	PVT	001	<1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SANTA CRUZ
HOLLISTER
SALINAS
PACIFIC OCEAN
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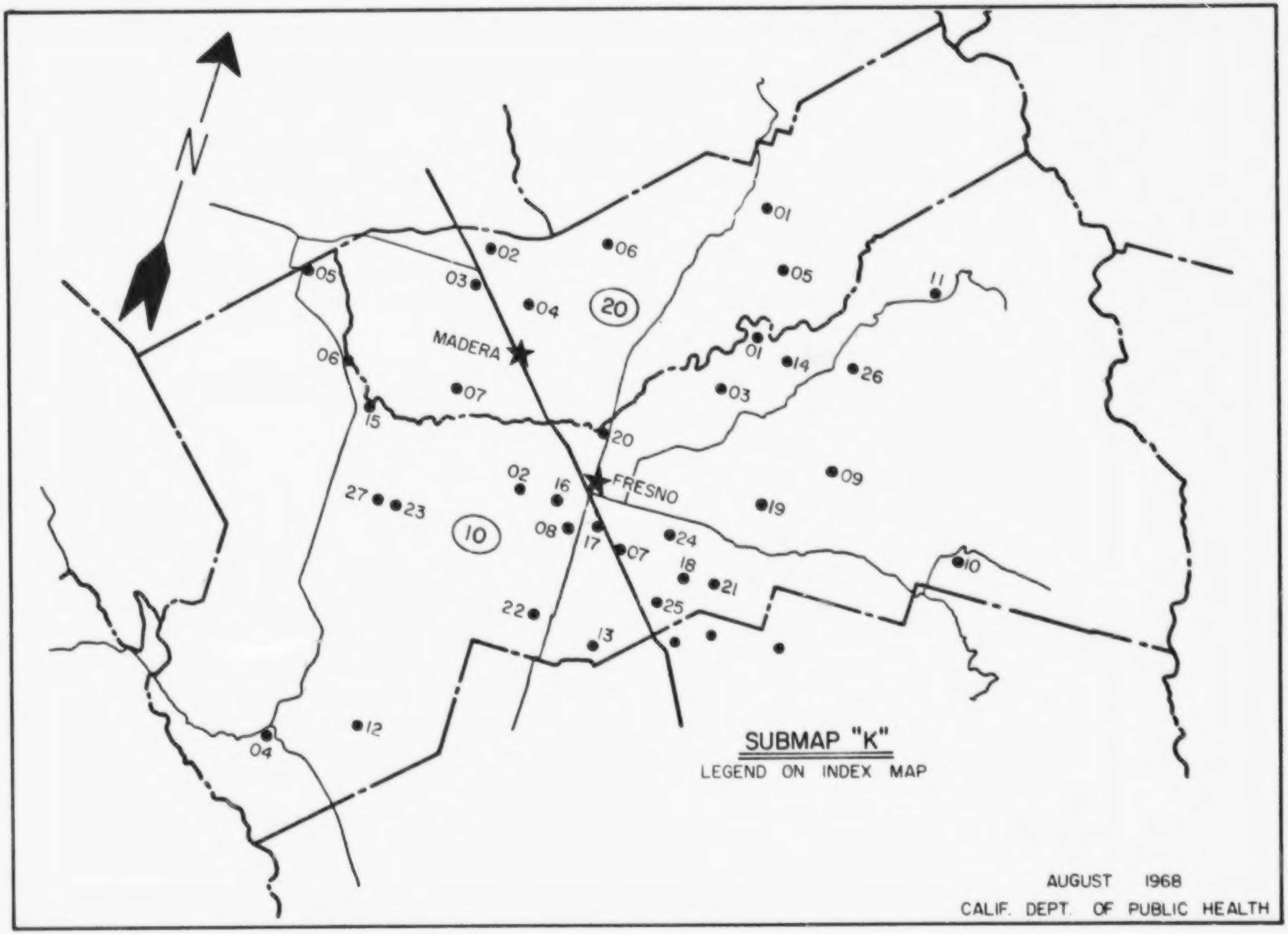
SUBMAP "J"

LEGEND ON INDEX MAP

AUGUST 1968
CALIF. DEPT. OF PUBLIC HEALTH

SOLID WASTE DISPOSAL SITES

Site Code	Site Name	Type of Site	Operator	Total Acreage	Daily Tonnage
⑩ FRESNO					
01	AUBERRY	UBD	DIST	006	<1
02	CHATEAU FRESNO	MSL	PVT	080	0020
03	CLOVIS	MSLB	CITY	056	0013
04	COALINGA	SDB	CITY	130	0015
05	DOS PALOS	SDB	CITY	017	0005
06	FIREBAUGH	SDB	PVT	005	0003
07	FOWLER	SDB	CITY	003	0001
08	FRESNO	MSL	CITY	110	0300
09	GLEN MEADOW	UBD	FED	002	<1
10	HUME LAKE	UBD	FED	-	0001
11	HUNTINGTON LAKE	UBD	PVT	005	<1
12	HURON	UBD	CITY	001	0002
13	LATON	SL	PVT	010	0080
14	MEADOW LAKES	UBD	DIST	005	<1
15	MENDOTA	SDB	CITY	038	0005
16	NEILSON AVE	MSL	PVT	010	0015
17	ORANGE AVENUE	MSL	PVT	200	0250
18	PARLIER	UBD	CITY	025	0001
19	PINE FLAT	UBD	FED	001	<1
20	PINEDALE	MSL	PVT	042	0028
21	REEDLEY	UBD	CITY	012	0002
22	RIVERDALE	SL	PVT	020	0005
23	SAN JOAQUIN	UBD	DIST	002	0002
24	SANGER	SDB	CITY	040	0004
25	SELMA SCAVENGER CO	MSL	PVT	010	0002
26	SHAVER LAKE	UBD	PVT	-	<1
27	TRANQUILLITY	UBD	DIST	010	0001
⑳ MADERA					
01	BASS LAKE	UBD	CO	010	0002
02	CHOWCHILLA	UBD	CITY	026	0010
03	FAIRMEAD	UBD	CO	030	0005
04	MADERA	SDB	CITY	080	0025
05	NORTH FORK	UBD	CO	010	0001
06	RAYMOND	UBD	CO	005	0001
07	RIPPERDAN	SDB	CO	010	0001



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SUBMAP "K"

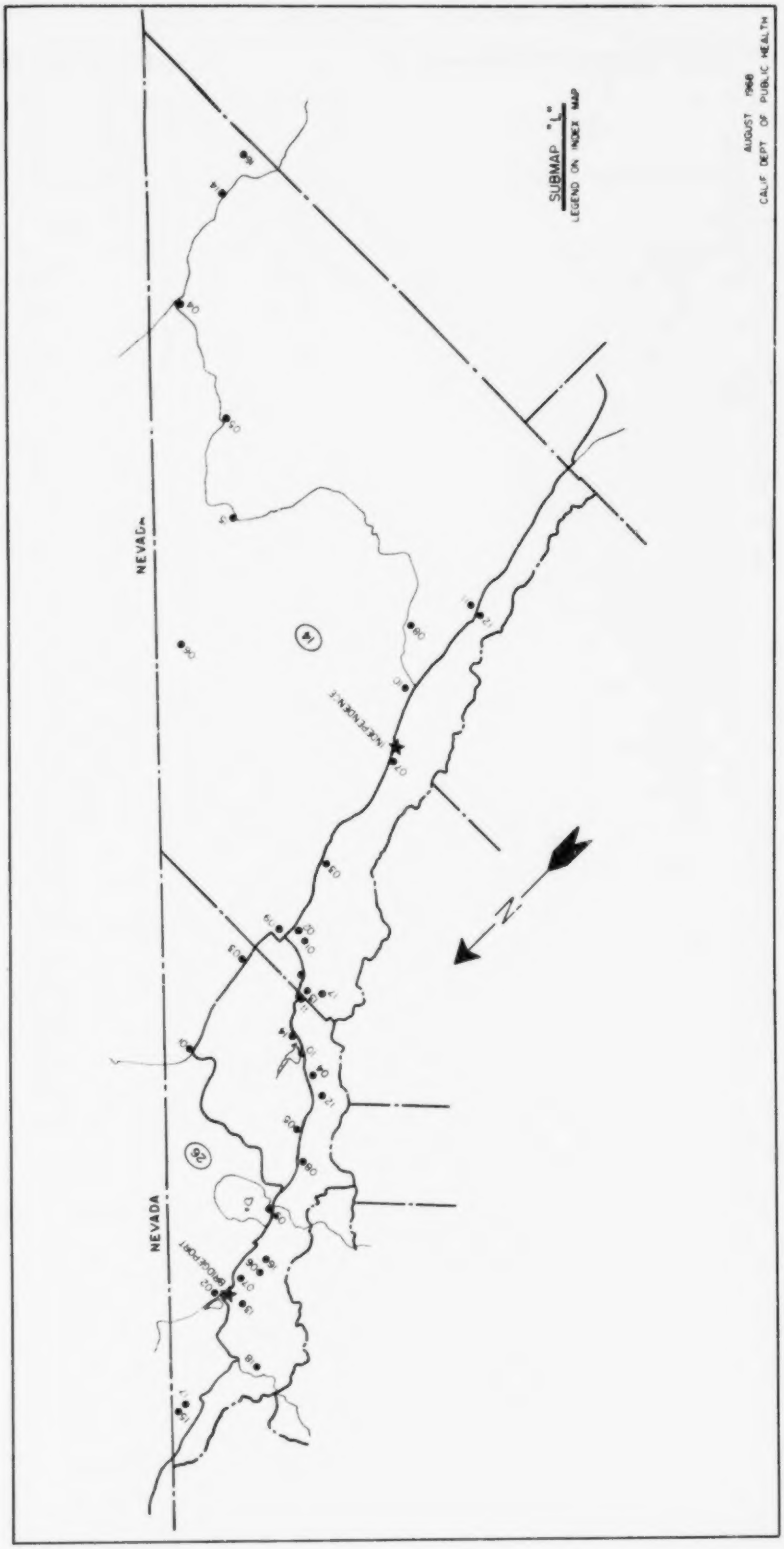
LEGEND ON INDEX MAP

AUGUST 1968

CALIF. DEPT. OF PUBLIC HEALTH

SOLID WASTE DISPOSAL SITES

Site Code	Site Name	Type of Site	Operator	Total Acreage	Daily Tonnage
⑭ INYO					
01	BARLOW LANE	UBD	CO	010	0001
02	BEACON	UBD	CO	065	0015
03	BIG PINE	UBD	CO	010	0001
04	DEATH VALLEY JUNCTION	UBD	PVT	001	<1
05	FURNACE CREEK	SDB	FED	010	0002
06	GRAPEVINE	SDB	FED	001	<1
07	INDEPENDENCE	UBD	CO	040	0001
08	KEELER	UBD	CO	004	<1
09	LAWS	UBD	CO	015	0002
10	LONE PINE	UBD	CO	020	0001
11	OLANCHA COUNTY	UBD	CO	002	<1
12	OLANCHA STATE	UBD	STATE	005	<1
13	ROUND VALLEY	UBD	CO	010	<1
14	SHOSHONE	UBD	CO	100	<1
15	STOVEPIPE WELLS	UBD	FED	001	<1
16	TECOPA	UBD	CO	005	<1
17	UNION CARBIDE	UBD	PVT	001	0002
㉖ MONO					
01	BENTON STATION	UBD	CO	003	<1
02	BRIDGEPORT	UBD	CO	003	0003
03	CHALFANT	UBD	CO	003	<1
04	CONVICTLAKE	UBD	FED	001	<1
05	CRESTVIEW	UBD	STATE	001	<1
06	GREEN CREEK	UBD	FED	001	<1
07	GREEN LAKE RD	UBD	CO	002	<1
08	JUNE LAKE	UBD	CO	005	0005
09	LEE VINING	UBD	CO	010	0002
10	LONGVALLEY	UBD	CO	005	<1
11	LOWER ROCK CREEK	UBD	CO	002	<1
12	MAMMOTH LAKE	UBD	CO	005	0003
13	ROBINSON CREEK	UBD	FED	005	0002
14	TOMS PLACE	UBD	CO	003	0001
15	TOPAZ	UBD	CO	003	<1
16	VIRGINIA LAKES	UBD	FED	003	<1
17	WALKER	UBD	CO	003	0001
18	USMC COLD WEATHER CAMP	UBD	FED	004	0001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AUGUST 1968
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NEVADA
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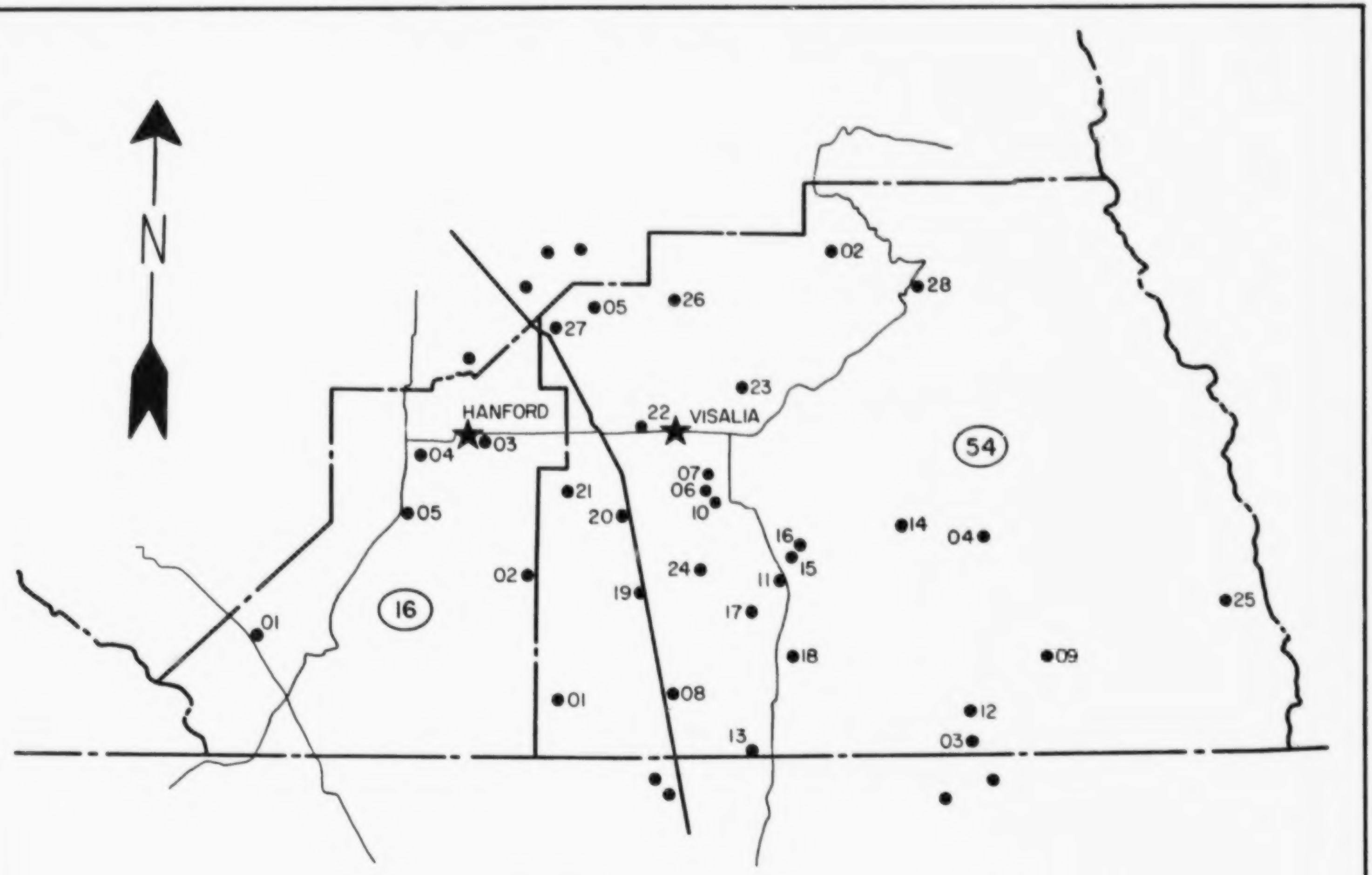
SOLID WASTE DISPOSAL SITES

Site Code	Site Name	Type of Site	Operator	Total Acreage	Daily Tonnage
(16) KINGS					
01	AVENAL CSD	UBD	DIST	005	0002
02	CORCORAN	SDB	CITY	165	0010
03	HANFORD	MSLB	CO	080	0030
04	LEMOORE	SDB	CITY	075	0012
05	STRATFORD	UBD	CO	015	0002
(54) TULARE					
01	ALPAUGH	UBD	CO	002	0001
02	BADGER	UBD	CO	007	<1
03	BALANCE ROCK	UBD	CO	005	<1
04	CAMP NELSON	UBD	CO	008	<1
05	DINUBA	UBD	CITY	007	0035
06	EXETER CITY	SDB	CITY	020	0023
07	EXETER COUNTY	SDB	CO	040	0006
08	EARLIMART	SDB	CO	040	0003
09	FAIRVIEW	UBD	FED	004	<1
10	LINDSAY	SDB	CITY	008	0010
11	PORTERVILLE	MSLB	CITY	005	0003
12	PINE FLAT	UBD	CO	001	<1
13	RICHGROVE	SDB	CO	047	0001
14	SPRINGVILLE	SDB	CO	013	0002
15	STRATHMORE	SDB	CO	016	0008
16	SURBURBAN DISPOSAL	UBD	PVT	005	0025
17	TEAPOT DOME	SDB	CO	132	0030
18	TERRA BELLA	SDB	DIST	070	0002
19	TIPTON	SDB	CO	004	0001
20	TULARE CITY	SDB	CITY	030	0055
21	TULARE COUNTY	SDB	CO	018	0002
22	VISALIA	SDB	CO	135	0063
23	WOODLAKE	SDB	CO	007	0015
24	WOODVILLE	SDB	CO	073	0004
25	KENNEDY MEADOWS	UBD	CO	010	<1
26	OROSI	SDB	CO	040	0005
27	KINGSBURG	SDB	CITY	030	0007
28	WOODWARD CREEK	UBD	FED	-	0001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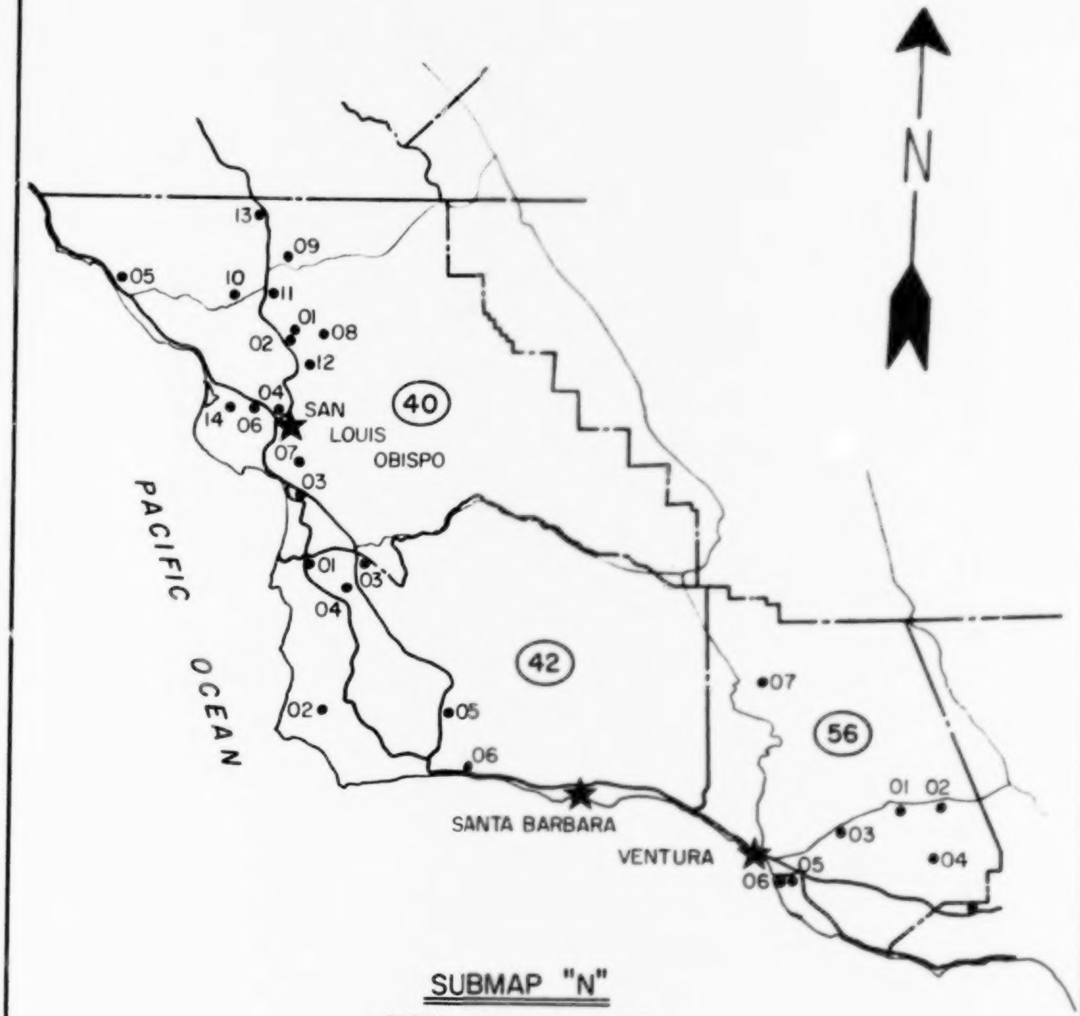
AUGUST 1968
CALIF. DEPT. OF PUBLIC HEALTH

SOLID WASTE DISPOSAL SITES

Site Code	Site Name	Type of Site	Operator	Total Acreage	Daily Tonnage
㊵ SAN LOUIS OBISPO					
01	ATASCADERO	SL	PVT	020	0007
02	ATASCADERO STATE HOSP	UBD	STATE	001	<1
03	BRISCO PIT	MSLB	PVT	010	0002
04	CAL POLY AT SLO	UBD	STATE	010	<1
05	CAMBRIA	UBD	PVT	003	0001
06	CAMP SAN LUIS	MSL	STATE	002	0001
07	COLD CANYON	MSLB	PVT	100	0033
08	CRESTON	UBD	CO	003	0002
09	CYA SCHOOL PASO ROBLES	SDB	STATE	002	0001
10	GOMER RANCH	MSL	PVT	010	0015
11	HINSON	UBD	PVT	050	0002
12	PERRY RANCH	UBD	CO	001	<1
13	SAN MIGUEL	SDB	DIST	003	0004
14	TURRI ROAD	MSL	PVT	050	0004
㊷ SANTA BARBARA					
01	GUADALUPE	SDB	PVT	008	0004
02	LUMPOC CITY LANDFILL	MSL	CITY	035	0060
03	SANTA MARIA	MSLB	CITY	127	0017
04	SANTA MARIA AIRPORT	SL	CO	020	0060
05	SOLVANG	MSL	CO	005	0033
06	TAJIGOUS	SL	CO	132	0410
(56) VENTURA					
01	FILLMORE	SDB	CITY	040	0010
02	PIRU	UBD	CO	020	0003
03	SANTA PAULA	SDB	CITY	007	0030
04	TIERRA REJADA	MSL	CO	044	0150
05	WAGON WHEEL	MSL	CO	054	0300
06	VENTURA COASTAL SITE	SL	PVT	176	0300
07	OZENA	UBD	CO	040	0001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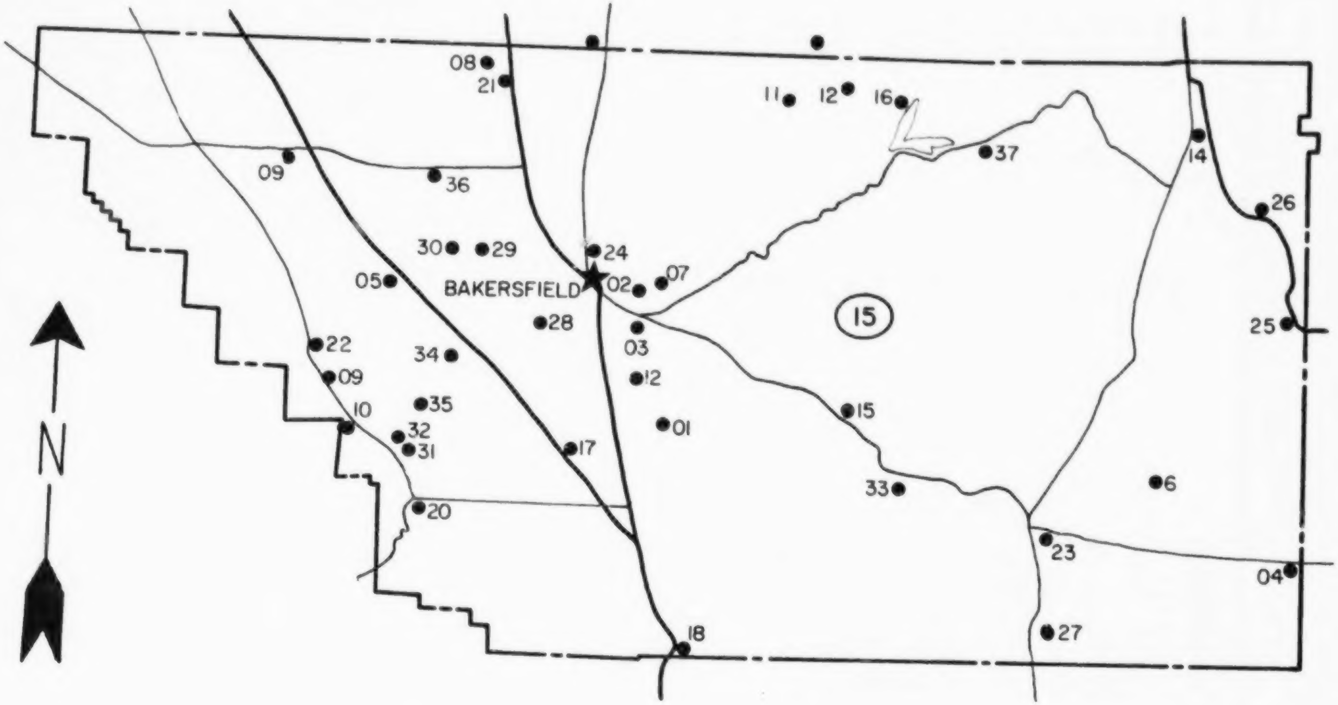
AUGUST 1968
CALIF. DEPT. OF PUBLIC HEALTH

SOLID WASTE DISPOSAL SITES

Site Code	Site Name	Type of Site	Operator	Total Acreage	Daily Tonnage
⑮ **KERN**					
01	ARVIN	SDB	CO	060	0010
02	BAKERSFIELD	SL	CITY	160	0200
03	BAKERSFIELD BRUSH	UBD	CITY	020	0005
04	BORON	UBD	CO	010	0005
05	BUTTONWILLOW	UBD	CO	040	0002
06	CALIFORNIA CITY	UBD	PVT	001	0001
07	CHINA GRADE	SDB	PVT	080	0200
08	DELANO	SDB	CITY	040	0040
09	DERBY ACRES	UBD	CO	004	<1
10	FELLOWS	UBD	CO	015	0001
11	GLENNVILLE	UBD	CO	005	<1
12	GREENFIELD	SDB	PVT	040	0120
13	GREENHORN	UBD	CO	003	<1
14	INYOKERN	UBD	CO	020	0002
15	KEENE	UBD	CO	002	<1
16	KERNVILLE	UBD	CO	020	0010
17	LAKEVIEW	UBD	CO	007	<1
18	LEBEC	UBD	CO	010	0003
19	LOST HILLS	UBD	CO	002	<1
20	MARICOPA	UBD	CO	010	0001
21	MCFARLAND	SDB	CO	040	0006
22	MCKITTRICK	UBD	CO	004	0001
23	MOJAVE	UBD	CO	020	0008
24	NORTH OF THE RIVER	SDB	CO	022	0075
25	RANDSBURG	UBD	CO	160	<1
26	RIDGECREST	SDB	CO	020	0010
27	ROSAMOND	UBD	CO	010	0002
28	ROSEDALE	SDB	CO	022	0003
29	SHAFTER CITY	UBD	CITY	003	0016
30	SHAFTER COUNTY	SDB	CO	040	0006
31	TAFT COUNTY	SDB	CO	020	0020
32	TAFT CITY	SDB	PVT	004	0012
33	TEHACHAPI	SDB	CITY	010	0010
34	TUPMAN	UBD	CO	010	<1
35	VALLEY ACRES	UBD	CO	004	0001
36	WASCO	SDB	CO	020	0020
37	WELDON	UBD	CO	010	<1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AUGUST 1968
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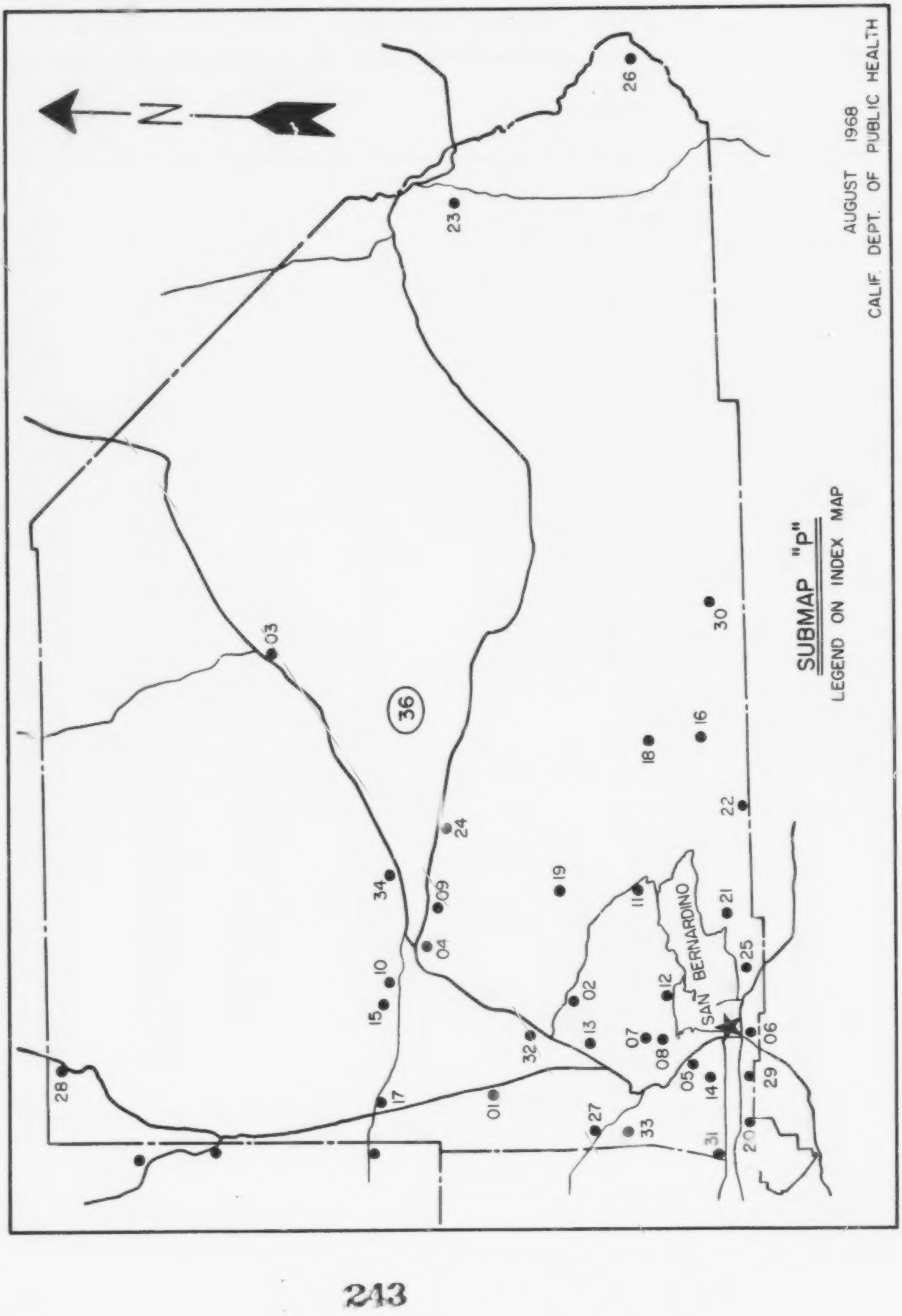
SOLID WASTE DISPOSAL SITES

Site Code	Site Name	Type of Site	Operator	Total Acreage	Daily Tonnage
㊱ SAN	BERNARDINO				
01	ADELANTO	UBD	CO	060	0025
02	APPLE VALLEY	UBD	CO	080	0015
03	BAKER	UBD	CO	040	0005
04	BARSTOW	UBD	CO	160	0015
05	CAJON BLVD	SL	CO	127	0240
06	CALIFORNIA ST	SL	CO	075	0270
07	CEDAR SPRINGS	UBD	CO	010	0001
08	CRESTLINE	UBD	CO	010	0040
09	DAGGETT	UBD	CO	080	0005
10	DESERT DISPOSAL	UBD	PVT	005	0050
11	DOBLE	SDB	CO	020	0015
12	HEAPS PEAK	MSL	CO	010	0100
13	HESPERIA	SL	CO	080	0015
14	HIGHLAND AVE	SL	CO	060	0125
15	HINKLEY	SDB	CO	160	0007
16	JOSHUA TREE	UBD	CO	025	0005
17	KRAMER JCT	UBD	CO	030	0001
18	LANDERS	UBD	FED	020	0005
19	LUCERNE VALLEY	UBD	CO	019	0007
20	MILLIKEN AVE	MSL	CO	070	0460
21	MILL CREEK	UBD	CO	010	0007
22	MORANGO VALLEY	SDB	CO	075	0015
23	NEEDLES	SDB	CO	040	0004
24	NEWBERRY	UBD	CO	040	0002
25	OAK GLENN ROAD	MSL	CO	520	0040
26	PARKER DAM	UBD	CO	040	0002
27	PHELAN DESERT SPRINGS	UBD	CO	080	0002
28	TRONA ARGUS	UBD	CO	048	0008
29	TROPICA RANCHO	SL	CO	090	0130
30	TWENTY NINE PALMS	UBD	CO	070	0002
31	UPLAND CITY	MSL	CITY	034	0075
32	VICTORVILLE	SDB	CO	080	0030
33	WRIGHTWOOD	UBD	CO	010	0010
34	YERMO	UBD	CO	040	0005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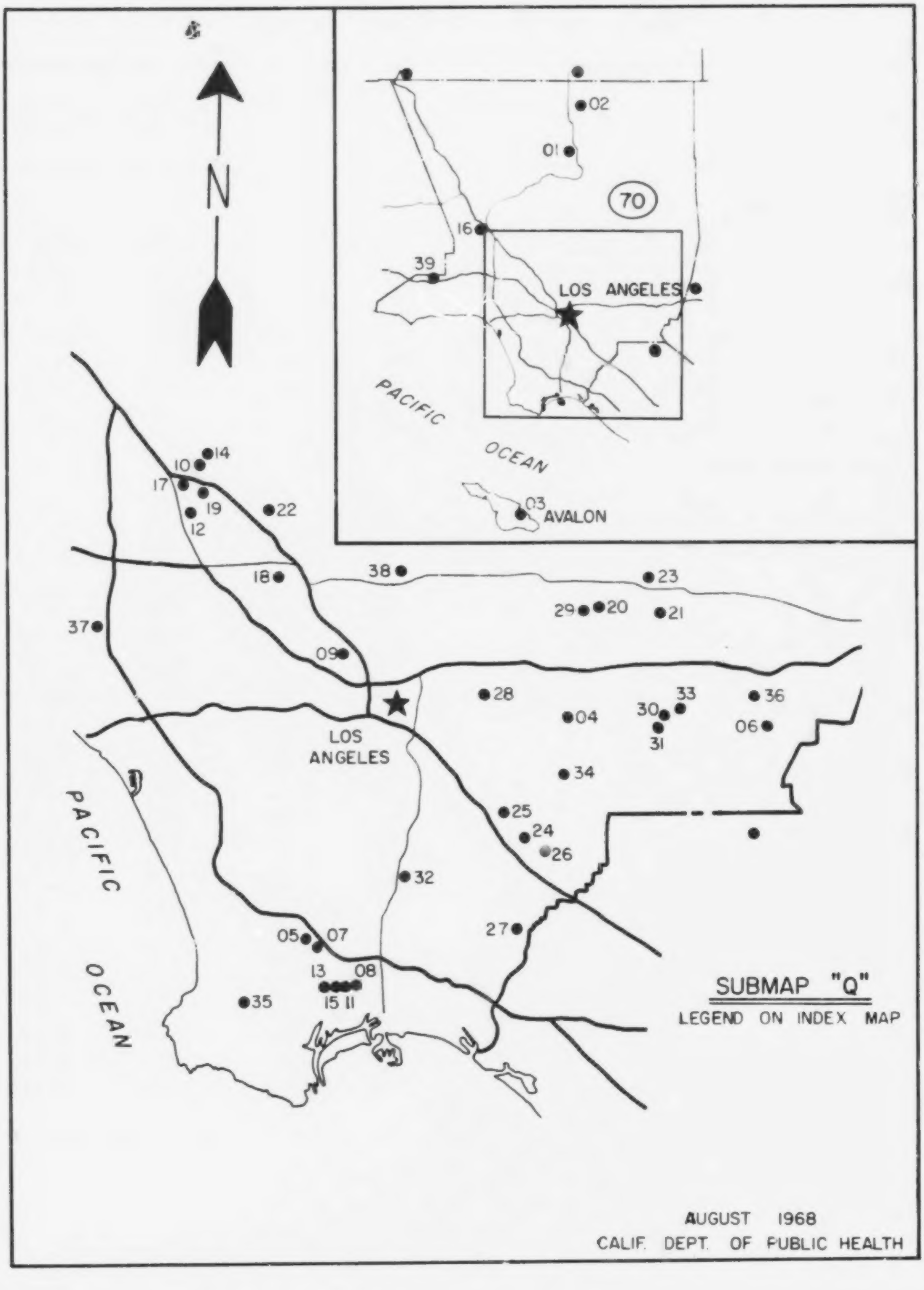
SOLID WASTE DISPOSAL SITES

Site Code	Site Name	Type of Site	Operator	Total Acreage	Daily Tonnage
(70)	LOS ANGELES				
01	ANTELOPE VALLEY	MSL	PVT	040	0055
02	LANCASTER DUMP CORP	SL	PVT	024	0060
03	PEBBLY BEACH	UBD	PVT	003	0002
04	SAN GABRIEL VALLEY	SL	PVT	550	2000
05	SOUTHWEST CONSERVATION	MSL	PVT	036	0950
06	VALLEY LAND DEV CO	SL	PVT	100	0140
07	WERDIN	OTHER	PVT	009	0030
08	ASCON DISPOSAL	SL	PVT	060	0350
09	BISHOPS CANYON	SL	CITY	020	1500
10	BRADLEY PIT	SL	PVT	030	0400
11	HARDWICK DISPOSAL PIT	SL	PVT	031	0500
12	HEWITT PIT	SL	PVT	063	0750
13	JAN COMPANY	MSL	PVT	022	0200
14	LIVINGSTON PIT	OTHER	PVT	040	0500
15	PORT DISPOSAL COMPANY	SL	PVT	044	1000
16	NORTH VALLEY	SL	PVT	300	0150
17	SHELDON ARLETA	SL	CITY	060	1100
18	TOYON CANYON	SL	CITY	150	1000
19	TUXFORD PIT	SL	PVT	066	0800
20	ALPHA INVESTMENT	OTHER	PVT	050	0185
21	AZUSA WESTERN INC	SL	PVT	040	0450
22	BURBANK RECLAMATION	SL	CITY	150	0200
23	CANYON PARK	SL	PVT	015	0850
24	KOBRA	MSL	PVT	015	0150
25	LA BYPRODUCTS INC	OTHER	PVT	030	0150
26	NORWALK DISPOSAL CO	MSL	PVT	018	0020
27	DAIRY VALLEY RECL PROJ	MSL	PVT	017	0040
28	OPERATING INDUS	SL	PVT	182	1500
29	OWL PARK CORP	SL	PVT	060	0961
30	PUENTE WASTE DISPOSAL	SL	PVT	080	0100
31	REFUSE DISP LAND RECLA	SL	PVT	097	0090
32	RULLO	OTHER	PVT	004	0100
33	WEST COVINA LANDFILL	SL	PVT	030	0400
34	WHITTIER	SL	CITY	032	0175
35	PALOS VERDES	SL	DIST	220	2250
36	SPADRA	SL	DIST	185	0500
37	MISSION CANYON	SL	DIST	485	3500
38	SCHOLL CANYON	SL	DIST	345	1850
39	CALABASAS	SL	DIST	380	0725



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AUGUST 1968

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PACIFIC OCEAN
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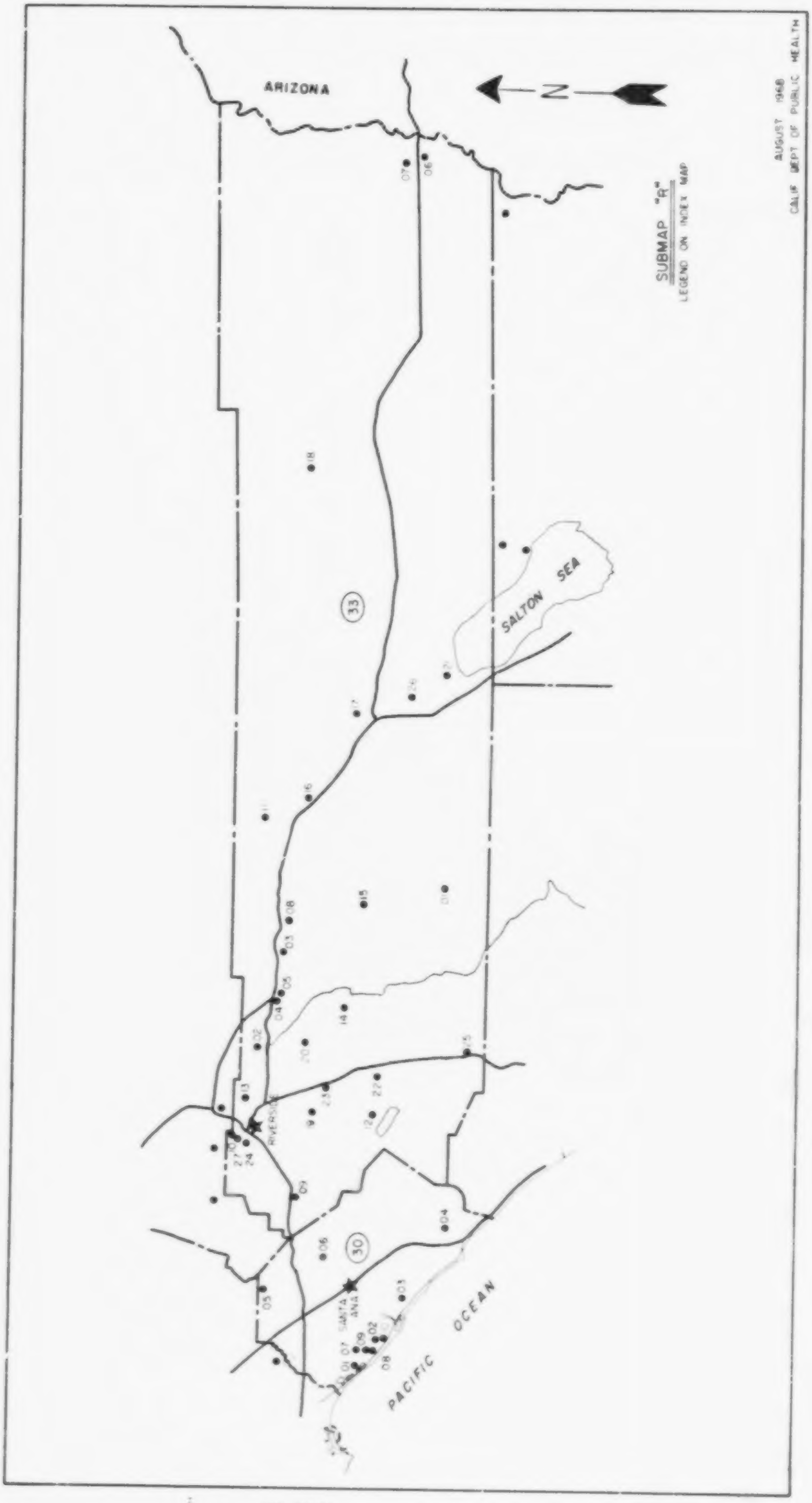
SOLID WASTE DISPOSAL SITES

Site Code	Site Name	Type of Site	Operator	Total Acreage	Daily Tonnage
㉚ ORANGE					
01	BOLSA CHICA	MSL	PVT	010	0010
02	CANNERY SITE 16	OTHER	CO	028	0150
03	COYOTE CANYON 24	SL	CO	593	1850
04	FORSTER CANYON 17	SL	CO	146	0170
05	OLINDA 20	SL	CO	233	1400
06	SANTIAGO CANYON 25	SL	CO	160	0250
07	FERM	OTHER	PVT	012	0010
08	BRUCE	OTHER	PVT	019	0010
09	MCCLELLAND	OTHER	PVT	015	0010
10	STEVERSON	OTHER	PVT	040	0025
㉝ RIVERSIDE					
01	ANZA	UBD	CO	010	<1
02	BADLANDS	MSL	CO	660	0022
03	BANNING	SDB	CITY	030	0050
04	BEAUMONT CITY	SDB	CITY	005	0005
05	BEAUMONT COUNTY	SDB	CO	018	0010
06	BLYTHE CITY	UBD	CITY	080	0007
07	BLYTHE COUNTY	UBD	CO	335	0005
08	CABAZON	UBD	PVT	010	<1
09	CORONA	MSL	CO	096	0185
10	CRESTMORE RD SOLID FIL	OTHER	CO	005	0013
11	DESERT HOT SPRINGS	SDB	CO	200	0008
12	ELSINORE	SDB	CITY	080	0005
13	HIGHGROVE	SDB	CO	020	0035
14	HEMET	MSL	CO	090	0065
15	IDYLLWILD	MSL	CO	009	0017
16	EDOM HILL	MSL	CO	642	0085
17	INDIO	MSL	CO	006	0053
18	KAISER	UBD	PVT	005	0006
19	KENNARD	UBD	PVT	080	<1
20	LAKEVIEW	SDB	CO	007	0001
21	MECCA	UBD	CO	010	<1
22	MENIFEE	SDR	CO	020	0025
23	PERRIS	SDB	CITY	020	0005
24	RIVERSIDE	SL	CITY	110	0175
25	TEMECULA	UBD	CO	004	0001
26	THERMAL	SDB	CO	030	0002
27	WEST RIVERSIDE	MSL	CO	062	0095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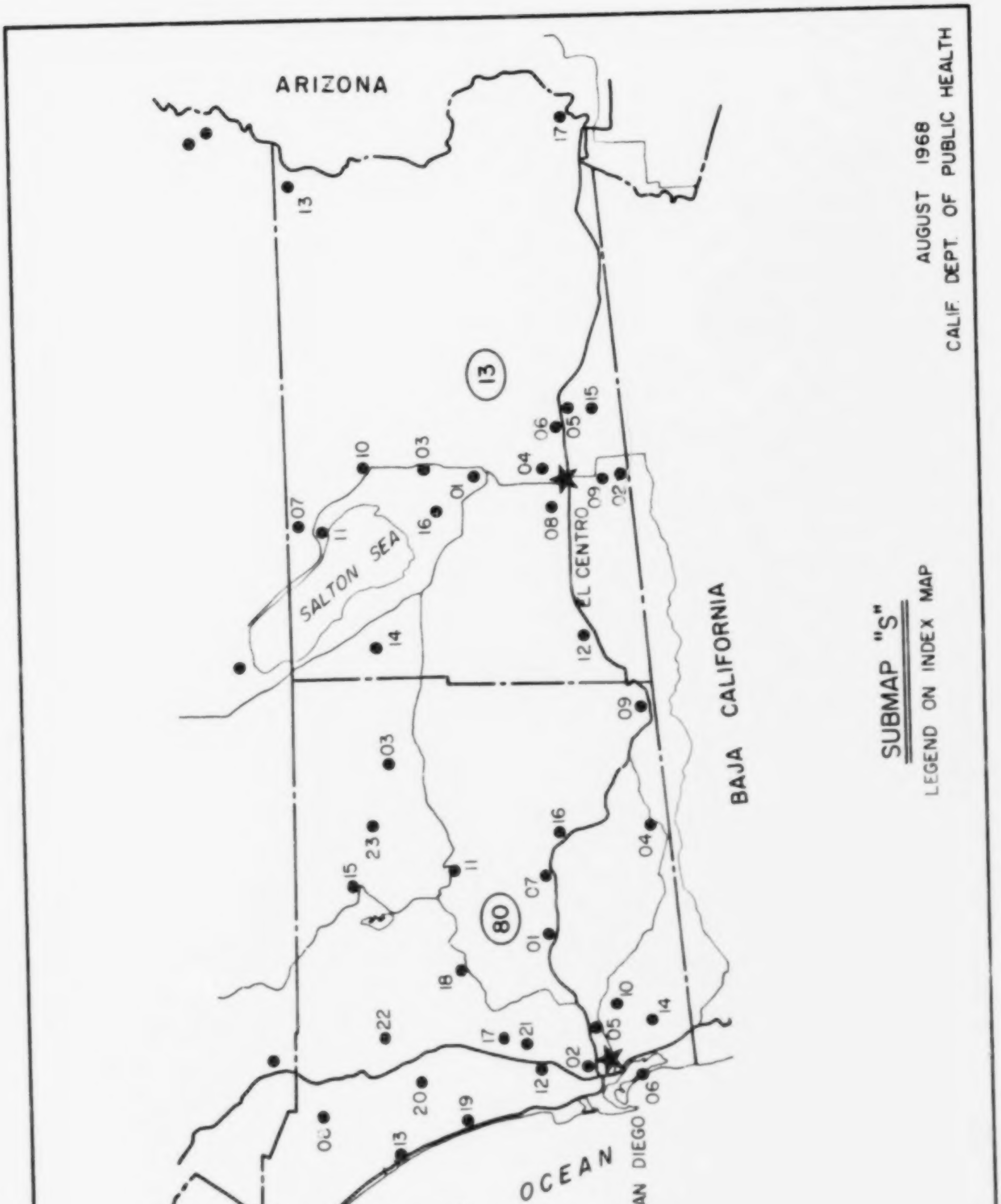
SOLID WASTE DISPOSAL SITES

Site Code	Site Name	Type of Site	Operator	Total Acreage	Daily Tonnage
⑬ IMPERIAL					
01	BRAWLEY	UBD	CITY	030	0025
02	CALEXICO	SDB	CO	005	0030
03	CALIPATRIA	UBD	CO	032	0002
04	EL CENTRO	UBD	PVT	040	0040
05	HOLTVILLE	UBD	CITY	002	0003
06	HOLTVILLE WEST	UBD	CO	014	0002
07	HOT SPA BOMBAY BEACH	UBD	CO	040	<1
08	IMPERIAL	UBD	CO	040	0003
09	LYONS CROSSING	UBD	CO	015	0001
10	NILAND	UBD	CO	040	<1
11	NILAND MARINA	UBD	CO	160	<1
12	OCOTILLO	UBD	CO	040	0001
13	PALO VERDE	UBD	CO	160	<1
14	SALTON CITY	UBD	CO	320	<1
15	VERDE	UBD	CO	007	<1
16	WESTMORELAND	UBD	CITY	005	0002
(80) SAN DIEGO					
01	ALPINE	SDB	CO	007	0010
02	ARIZONA	SL	CITY	139	0236
03	BORREGO	UBD	CO	040	0001
04	CAMPO	UBD	CO	006	0005
05	CHOLLAS	SL	CITY	367	0648
06	CORONADO	SDB	PVT	025	0040
07	DESCANSO	SDB	CO	002	0009
08	FALLBROOK	SL	CO	019	0020
09	JACUMBA	UBD	CO	010	0001
10	JAMACHA	SL	CO	042	0196
11	JULIAN	UBD	CO	014	0007
12	MIRAMAR	SL	CITY	449	0579
13	OCEANSIDE	MSL	CITY	012	0070
14	OTAY	SL	CO	265	0200
15	PALOMAR MOUNTAIN	SDB	CO	002	0003
16	PINE VALLEY	UBD	CO	010	0007
17	POWAY	SL	CO	040	0038
18	RAMONA	UBD	CO	080	0015
19	SAN ELIJO	SL	CO	040	0096
20	SAN MARCOS	SL	CO	024	0186
21	SYCAMORE	SL	CO	113	0169
22	VALLEY CENTER	SDB	CO	042	0020
23	WARNER SPRINGS	UBD	PVT	002	0001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SUBMAP "S"

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AUGUST 1968

CALIF. DEPT. OF PUBLIC HEALTH

CALIFORNIA SOLID WASTE PLANNING STUDY

Final Report

A PROGRAM PLAN FOR SOLID WASTE MANAGEMENT IN CALIFORNIA

JANUARY 1970

CALIFORNIA STATE DEPARTMENT OF PUBLIC HEALTH

250

STATE OF CALIFORNIA

Ronald Reagan, Governor

HUMAN RELATIONS AGENCY

Spencer Williams, *Secretary*

STATE DEPARTMENT OF PUBLIC HEALTH

Louis F. Saylor, M.D., *Director*

John M. Heslep, Ph.D., *Deputy Director*, Environmental Health and Consumer Protection Program

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California Conference of Directors of Sanitation, Solid Waste Committee
State Water Quality Advisory Committee, Solid Waste Subcommittee

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FOREWORD

The discards of our affluent, creative, and technological society are continually increasing in quantity and complexity, representing a threat to health and well-being, and creating serious burdens on the environment. Solid wastes have recently come into focus as competition for land, rising costs, and archaic practices emerge in direct conflict with demands for improved environmental quality and conservation of resources. Yesterday's meal, broken furniture, yard rubbish, manure, manufacturing rejects, and the multitude of other waste materials must be dealt with when the possessor no longer finds use for these items.

The protection of public health is of paramount importance. However, the quality of our land, water and air resources, and a habitat free of nuisances is also of vital concern to our State's future. California has mounted noteworthy efforts to combat air and water pollution, and effective mechanisms and resources have been developed to fulfill the State's responsibilities in meeting these needs. Similar accomplishments have not been achieved with respect to solid wastes. The deficiencies in management of these wastes are evident through observation of the casual manner in which they are handled in a system which often appears predicated on keeping them as far out of sight and smell as is necessary to keep them out of mind. The present state of solid waste management, which directly affects our entire ecosystem, is clearly inadequate to assure the preservation of minimum acceptable levels of public health and environmental quality.

The Congress acknowledged the solid waste crisis by the enactment of the "Solid Waste Disposal Act of 1965". This Act provided funds for developing and demonstrating new techniques and improved methods of managing solid wastes. Also included were funds for use by state agencies to assess the problems and to develop comprehensive plans for meeting them. The availability of federal support, coupled with a growing awareness of the solid waste management needs by the State, led to a directive by the Governor designating the Department of Public Health to receive these planning funds.

The ensuing study and analysis was one of the most comprehensive statewide investigations of solid wastes and their resultant problems ever undertaken in the country. The initial phase entailed a survey to develop the basic foundation of information upon which an effective statewide program of solid waste management could be structured. Two years and the assistance of a wide variety of local agencies and private concerns were required to gather and assimilate the extensive field data. Development of a specific program plan constituted the second phase of the study.

In 1968, legislation was adopted requiring the Department of Public Health to submit a final report, including results of the solid waste planning study and attending recommendations, to the newly created State Environmental Quality Study Council by February 1, 1970. The legislation requires that the Council review and comment on the report and submit it to the Legislature within 30 days after it is received.

The results of the California Solid Waste Planning Study are being presented in two reports. The first report (Volume I), *The Status of Solid Waste Management in California*, September 1968, summarizes the results and findings of field surveys, provides analyses of major solid waste problems, tabulates types and quantities of wastes produced, and documents and interprets the basic data regarding solid waste facilities and practices. The second report, presented here, is entitled *A Program Plan For Solid Waste Management in California*.

This final report contains the recommendations and elements for a coordinated statewide solid waste management program drawing upon the collaborative efforts of state and local governments and private industry. This plan can deal effectively with the immediate problems and provide the framework for achieving ultimate goals and objectives. The major conclusions and resulting action recommendations are summarized in Chapter I. Important details regarding the status of the solid waste problem in California are summarized for ready reference in Chapter II. Chapter III outlines the responsibilities which the state government might properly assume, as well as those responsibilities which logically should be assigned to local government. Chapter IV presents the detailed elements of the proposed state action program embracing the five elements of technology, standards and regulation, planning, surveillance, and public information. Specific objectives for each element are presented and the recommended means for accomplishment are described. Chapter V contains suggested basic enabling legislation in the form of a comprehensive Solid Waste Management Act. Such legislation is required to initiate the proposed program.

CHAPTER I

CONCLUSIONS AND RECOMMENDATIONS

California's most urgent need concerning solid wastes is an effective mechanism for coordinating state, local and private responsibilities in managing these wastes in a manner consistent with optimum public health and environmental quality criteria. Meeting this need will require a carefully conceived, thoroughly planned, and vigorously executed program based on clearly defined authority and adequate resources for both state and local government participation.

CONCLUSIONS

The following are the major conclusions derived from the intensive study conducted by the Department of Public Health. They are based upon data gathered by field investigations, interviews with involved agencies and interests, and analyses by a broad group of experts in the field.

1. Solid wastes are creating health hazards and nuisances; they are causing impaired air and water quality; they are steadily degrading land values; they have a destructive influence on the quality of the total environment; and they are imposing a high economic burden on the people of California. Present provisions for statewide solid waste management are inadequate to resolve these problems.
2. Rapidly increasing quantities of solid wastes produced in California threaten to reach unmanageable proportions and are emerging as a formidable threat to the future environment. In 1967, 71 million tons of solid wastes were produced; by 2000, annual production will increase to over 125 million tons.
3. The continued use of the land as a sink to receive solid wastes will not be adequate. Solid waste management must have a goal of reclamation and reuse as an ultimate solution.
4. The basic areas of deficiency in solid waste management in California are: (1) fragmented authority and lack of coordination; (2) inadequate planning; (3) nonexistent or inadequate standards; (4) lagging technology; and (5) insufficient financing.
5. State laws relative to solid wastes are, for the most part, directed toward minimizing water pollution, preventing forest fires, protecting fish and wildlife, assuring the health of livestock, and preserving the aesthetics of highways. There is a very notable lack of solid waste laws concerned specifically with protection of the health and and well-being of people, or to deal with the problems in a comprehensive way.
6. It is imperative that the State assume leadership in coping with these problems by initiating an effective program of solid waste management with the involvement of local governments and participation by private industry.
7. It is essential that there be a legislatively mandated solid waste program at the State level to centralize its policy formulation, provide overall direction and guidance, coordinate state and local efforts, develop and implement minimum standards, stimulate improved technology, encourage reductions in waste production and support reutilization of materials in our solid wastes.

RECOMMENDATIONS

Based upon the above conclusions the State Department of Public Health recommends the following actions:

1. That the State, through the Department of Public Health, initiate the development of an effective solid waste management program to meet responsibilities in the areas of technology, planning, standards and regulations, surveillance, and information and training. Activities of the Department in such a program would include:
   a. promote and coordinate research and development for improvement of solid waste technology and participate in studies associated with various aspects of solid waste management;
   b. provide for the coordinated development of solid waste management plans, and require that each county develop a comprehensive solid waste management plan, with the Department of Public Health providing coordination, technical assistance and financial loans or grants to assist in the development of these plans;
   c. develop and adopt minimum standards and regulations for solid waste storage, collection, transportation, and disposal to prevent health hazards, nuisances, and environmental pollution;

d. provide for the monitoring and inventory of solid waste facilities and practices to determine problems and effectiveness of programs, and to provide information on solid waste management; and

e. establish and maintain a program of training, education, and public information to improve the level of expertise and public awareness of solid waste management.

State and local responsibilities are outlined in further detail in Chapter III. The specific elements of the State programs are described in Chapter IV.

2. That a "Solid Waste Management Act" such as is proposed in Chapter V be enacted in 1970.

CHAPTER II

THE SOLID WASTE PROBLEM

The Volume I report, *Status of Solid Waste Management in California,* thoroughly documented the problems associated with present solid waste handling practices in California. This chapter summarizes these problems. Divided into three sections, the first discusses the magnitude of the problem, current and projected. The second section describes the existing practices and deficiencies of solid waste management. The third section presents a future outlook for solid waste management.

SOLID WASTE PRODUCTION

In 1967, more than 71 million tons of solid wastes were produced. By the year 2000, an estimated 125 million tons of solid wastes will be generated annually by domestic, commercial, industrial, and agricultural activities.

Projections presented in this section reflect totals of solid wastes generated, resulting in production figures comparable to those in Volume I. Other reports often cite only portions of the solid wastes from a community, generally those amounts that are being disposed of at general-use disposal sites. Included here is the total output of solid wastes, thus accounting for all residential wastes including the materials which are discharged to the sewer, burned in the backyard, and removed by refuse collection services; industrial wastes incinerated in on-site facilities or disposed of on the plant properties; and the agricultural wastes which are piled in mounds or plowed into the earth. Derivation of the forecasted data for the years 1985 and 2000 was accomplished through evaluation and adjustment of the waste generation factors developed for 1967 solid waste tonnages, taking into consideration anticipated technological, demographical, and sociological changes.

The three major categories of municipal, industrial, and agricultural wastes are used to present the quantities of solid wastes produced. The following are examples of solid wastes in these three categories:

1. Municipal Wastes
    a. Residential garbage, rubbish, and other refuse
    b. Commercial refuse
    c. Demolition and construction wastes
    d. Special wastes including street refuse and sewage treatment residue
2. Agricultural Wastes
    a. Manure from penned livestock
    b. Fruit and nut crop wastes
    c. Field and row crop wastes
3. Industrial Wastes
    a. Food processing wastes
    b. Lumber processing wastes (sawmills, planing mills, logging)
    c. Chemical and petroleum processing wastes
    d. Manufacturing wastes

Table 1. is a tabulation of the estimated solid waste production in California for the years 1967, 1985, and 2000. The quantities of solid wastes which must be managed in the future are graphically illustrated in Figures 1 and 2.

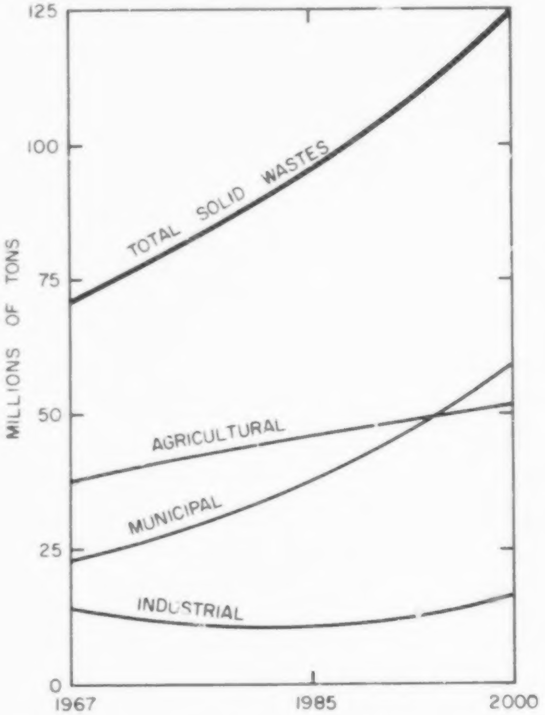
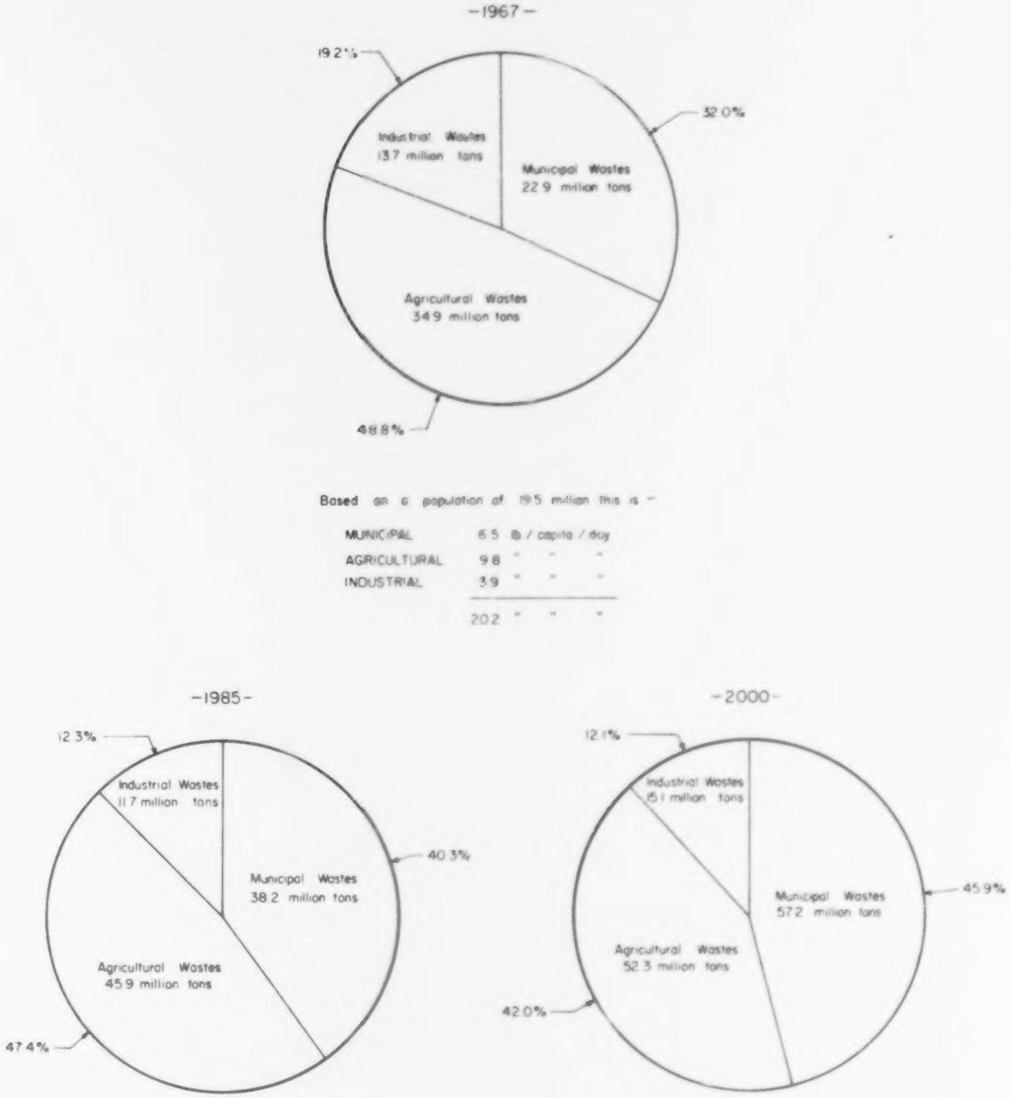


FIGURE 1. ESTIMATED ANNUAL SOLID WASTE PRODUCTION



Based on a population of 19.5 million this is –

MUNICIPAL	6.5	lb / capita / day
AGRICULTURAL	9.8	" " "
INDUSTRIAL	3.9	" " "
	20.2	" " "

Based on a population of 29.5 million this is –

MUNICIPAL	7.1	lb / capita / day
AGRICULTURAL	8.5	" " "
INDUSTRIAL	2.2	" " "
	17.8	" " "

Based on a population of 40.6 million this is –

MUNICIPAL	7.7	lb / capita / day
AGRICULTURAL	7.1	" " "
INDUSTRIAL	2.0	" " "
	16.8	" " "

FIGURE 2. PRODUCTION OF SOLID WASTES IN CALIFORNIA, 1967 - 1985 - 2000

Table 1. Quantitative estimates of solid waste production

Type of Waste	Annual Quantity (Million Tons)		
	1967	1985	2000
Municipal Wastes			
Residential	8.9	16.1	25.9
Commercial	9.7	15.7	22.7
Demolition	3.0	4.4	5.9
Special	1.3	2.0	2.7
Subtotal	22.9	38.2	57.2
Agricultural Wastes			
Animal manure	21.8	28.5	32.7
Fruit and nut crop	2.4	3.6	3.9
Field and row crop	10.7	13.8	15.7
Subtotal	34.9	45.9	52.3
Industrial Wastes			
Food processing	2.1	3.7	6.3
Lumber industry	8.0	2.7	1.0
Chemical and petroleum refining	.5	.5	.8
Manufacturing	3.1	4.8	7.0
Subtotal	13.7	11.7	15.1
Total	71.5	95.8	124.6

Municipal Wastes

Municipal waste production is directly attributable to population; these projections are therefore directly related to population forecasts. Population projections for 1985 and 2000 were developed from preliminary studies by the Department of Finance and Department of Water Resources. In developing waste generation factors it was necessary to identify the changing character of municipal wastes over the past 20 years as a basis for anticipating future trends. For example, the consumer is purchasing an increasing number and quantity of disposable items causing per capita amounts to increase. The expanding use of partially prepared packaged food and other convenience packaged items has increased the amount of paper and paper products in use, and decreased the percentage of garbage in municipal wastes. The increased use of cans, nonreturnable bottles and plastics has also affected the characteristics of municipal solid wastes. The major concern for California, however, is not the per capita increase in wastes produced, but the overall increase attributable to population growth.

Municipal waste production is expected to increase from 22.9 to 57.2 million tons per year by the year 2000 (Table 1), an increase of about 150% over the 1967 figure. These projections indicate that the municipal waste output will surpass agricultural wastes as the largest category of solid waste production during the early 1990's. Residential wastes can be expected to triple in quantity over the next 30 years.

Agricultural Wastes

California should continue to lead the nation in overall agricultural production, although some agricultural products will probably remain static, and a few may even decrease in volume. Projections of agricultural waste production were made by applying the agricultural solid waste generation factors used in Volume I to the projected future crop acreages and animal population forecasts.

Table 1 shows the amounts of agricultural wastes expected to be produced for the years 1985 and 2000, and Figure 2 depicts the proportion of agricultural wastes relative to the other two categories of solid wastes. Per capita comparisons are also shown in this figure for 1967, 1985, and 2000. The total quantity of agricultural wastes is expected to increase over 30% between 1967 and 1985, and to over 50% by year 2000. The top areas of the state for agricultural waste production will continue to be the San Joaquin and Imperial valleys. The major portion of the wastes will also continue to be animal manure.

Industrial Wastes

Industrial solid wastes include rubbish and processing wastes associated with mechanical or chemical transformation of inorganic or organic substances into new products or from assembling component parts. These are primarily wastes from the industries classified under Division D—Manufacturing (Major Groups 19 through 39) of the Standard Industrial Classification System (SIC). A detailed discussion of the production and disposal of industrial solid wastes in California is presented in the May 1969 issue of *California Vector Views* published by the Department [1].

Increased utilization of lumber residues should result in a reduction of lumber industry wastes from the present nearly 8 million tons to 2.7 million tons in 1985, with a further reduction to 1.0 million tons by the year 2000. California's total industrial growth by the end of the century is expected to obscure the waste reductions of the lumber industry, with 15.1 million tons of industrial solid wastes being projected for the year 2000.

STATUS OF SOLID WASTE MANAGEMENT

Volume I presented the findings of the statewide survey and an evaluation of 1967–68 solid waste management practices in California. That report may be regarded as a data bank on the existing practices. Thus, for a detailed discussion of current solid waste management programs, readers are urged to refer to the Volume I report.

Summary of Practices and Programs

The regulation, collection, utilization, and disposal of solid wastes, as well as the planning of management systems, are activities shared by numerous governmental jurisdictions and private interests. The State thus far has no clear provisions for establishing policies or guidelines for solid waste management. Only a few single purpose regulations exist and little stimulation is provided for improving the total system of storage, collection, and disposal. Every city and county in California is empowered to provide solid waste management services within their respective jurisdictions.

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[1] Cornelius, James. 1969. Production and disposal of industrial solid wastes in California. *California Vector Views* 16 (5):35-52.

In addition, there are 1126 special-purpose districts empowered by law to perform solid waste management functions.

The programs, policies, and roles of the 58 counties and 399 cities range from high interest to total disregard. Many of these governmental units function exclusively on the basis of economically oriented priorities with little awareness of conservational needs or environmental quality considerations.

Refuse collection services may be publicly operated, performed by private firms, or both types of operations may serve the same city. It is estimated that there are about 900 refuse collection agencies now operating in California, providing every city and most urban communities in the state with some form of refuse collection service. Nearly 2 million persons, about 10% of the population, do not subscribe to any kind of collection service, either because it is unavailable or they do not wish to use the service.

Solid waste disposal methods in use generally involve some variation of burning or burying. Municipal wastes in California are disposed of almost exclusively by open burning or burying in landfills. Industrial wastes are in many cases disposed of on-site by landfill or are burned either in industrial waste incinerators or in the open. Crop stubble and tree prunings are burned at the end of the agricultural growing season and cull fruit and vegetables are sometimes plowed into the soil.

In the 1967 statewide survey, disposal sites were divided into two categories: "general-use" and "supplemental". General-use sites were those which received municipal refuse or a variety of wastes. Supplemental sites were those which received only a specific type of waste (e.g., street refuse, slag, cannery wastes, etc.) or served only a special group, such as a resort, campground, or construction site. Approximately 500 supplemental sites were located and many more are known to exist. In most instances these supplemental sites were not regulated by local jurisdictions, and operational details were unavailable.

The 716 general-use disposal sites in use in California during 1967 received some 19.5 million tons of refuse per year. All disposal sites which accepted municipal refuse were inspected, evaluated, and classified according to the quality of operation. Basic information on each general-use site is included in Volume I. Each of these was classified as follows: uncontrolled burning dump, supervised dump with burning, modified sanitary landfill with burning, modified sanitary landfill, sanitary landfill, or other. These classifications are completely defined in Volume I.

The sanitary landfill is generally accepted as the ideal classification for a land disposal site. The most essential operational feature of a sanitary landfill is complete daily covering of all solid wastes. In addition, there must be no burning, and there should be a minimal working face and an overall neat appearance. Only 67, or 9% of the total 716 general-use sites in the state, were classified as sanitary landfills. A large percentage of these sanitary landfills are in southern California. Los Angeles County, for example, has 27 and San Diego County has 10. Figure 3 shows the numbers and the relative percentages of the different types of sites.

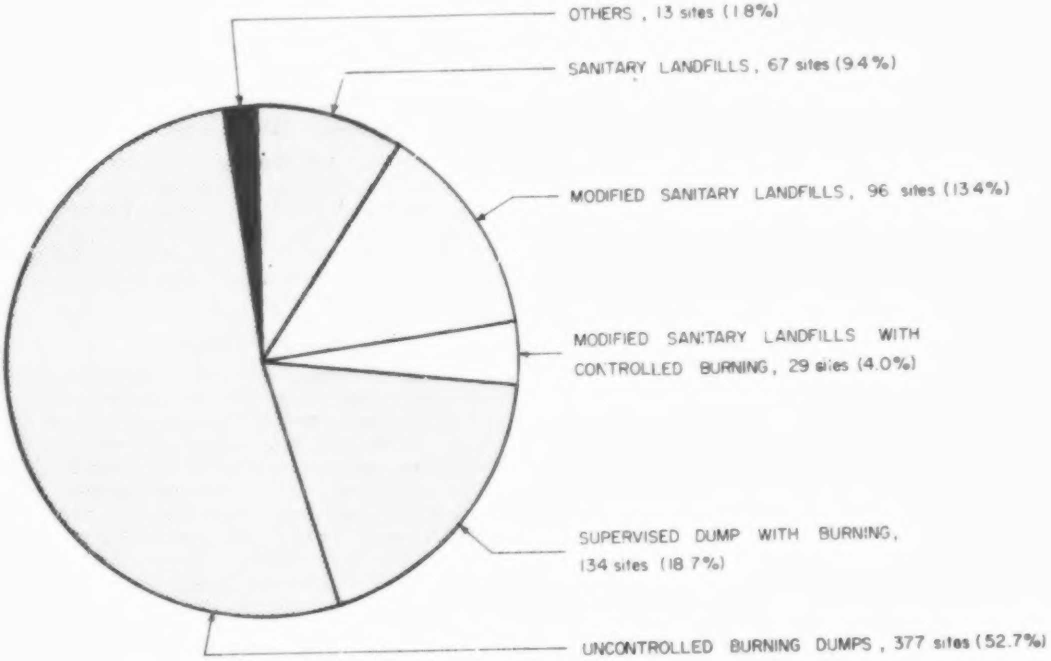

FIGURE 3. TYPES OF SOLID WASTE DISPOSAL SITES, 1967

The increasing volume of wastes being produced is exhausting the capacity of landfills at record rates. From 1967 survey data it is possible to extrapolate that 27% of the existing disposal sites will be filled by 1973 under present operating conditions. The total remaining capacity of all existing general-use sites in the state was estimated to be 718,000 acre feet. Figure 4 projects the remaining capacity of disposal sites on a statewide basis. Landfill requirements for municipal solid waste disposal in general-use sites predicated upon discontinuation of open burning indicate that the remaining capacity would be exhausted by 1978. If all the existing sites could be converted to sanitary landfill operations, greater quantities of wastes could obviously be accommodated through higher compaction (Figure 4—shaded area), extending the service of these sites almost ten years. These comparisons provide only a partial analysis of the problem since suitable disposal areas are not uniformly available throughout the state. Over 50% of the total remaining disposal capacity is centralized in 2% (14 sites) of the existing sites. This indicates something of the additional disposal site capacity required for the future.

The existing disposal site capacity will be exhausted in 31 of the 58 counties by 1985. Municipal wastes will require an estimated disposal capacity of 1,800,000 acre feet by the year 2000. All of the foregoing figures are referenced to municipal solid wastes only. Requirements for disposal of industrial wastes and some agricultural wastes will be an additional burden on many community landfill operations.

A summary of the more significant statewide survey findings regarding environmental effects indicate that:

a. Solid wastes are unique in that they may pollute the land, air, and water of the state primarily as a result of poor management practices.

b. Improperly stored solid wastes, inadequate collection systems, and poorly operated disposal sites support large populations of flies, rodents, and other vectors of disease.

c. In many areas the policy for refuse collection service encourages residents to retain their solid waste at their homes rather than having it removed on a frequent enough basis.

d. Occupational or safety hazards prevalent in the handling of solid wastes include injuries from fires and explosions, moving equipment, traffic hazards, and contact with hazardous wastes (e.g., pesticides).

e. Solid wastes were being discharged directly into surface water at 33 disposal sites. At 81 sites, solid wastes were or appeared to be in contact with ground waters. Inadequate provisions for control of surface water drainage were found at 207 sites.

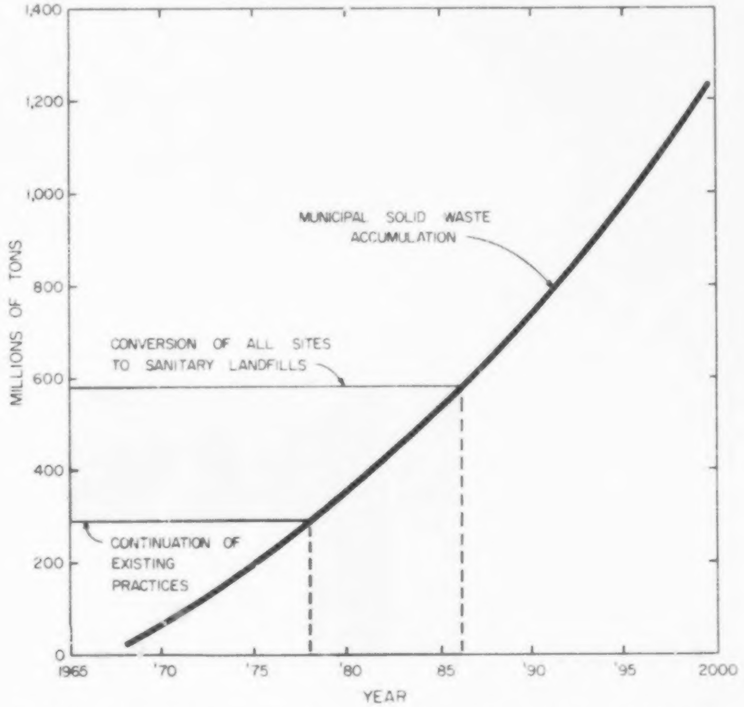

FIGURE 4. PROBABLE RANGE OF REMAINING LIFE OF DISPOSAL SITES

ENVIRONMENTAL EFFECTS OF MISMANAGED SOLID WASTES

Open burning and unsupervised dumps are the setting for numerous safety hazards and are also a source of domestic flies and rodents which are a threat to surrounding communities. Where there are open fires, burn injuries can be expected. Also, there have been reports throughout the state of permanent eye damage and other injuries from explosion of aerosol and glass containers. In addition, numerous fires are caused each year from open burning dumps.

Some sites are constructed in such a manner that an individual finds himself dumping over the side of a high embankment. At some of these sites there are no guardrails. At one such site a man was killed when he backed his car over the edge of the embankment.

Some of the finest landscapes in California are presently impaired by open burning dumps, causing air pollution, water pollution, and land degradation. Over 70% of the refuse disposal sites in California are open burning dumps.

f. Complete daily covering, the major deterrent to environmental problems, was provided at only 12% of the general-use disposal sites. *No* covering of the refuse on a routine basis is a characteristic of 468 disposal sites.

g. Open burning of refuse was found at disposal sites in 51 counties. Burning was observed at 540 disposal sites, contributing to smoke and odor problems. More than 250 fires requiring the use of outside fire control equipment originated from refuse disposal sites during 1967.

h. Agricultural wastes are not "managed" at all in any real or systematic sense.

i. Essentially no effort is being devoted to recycling solid wastes in the interests of resource conservation and prevention of environmental degradation.

Some of the environmental effects of mismanaged solid wastes are pictured on page 14.

Solid waste disposal need not be a restraint on environmental quality. Proper planning and operational practices can result in positive effects from properly handled solid wastes, achieving a dual purpose of disposal of the wastes while reclaiming more marginal quality lands such as quarries, low lands, and canyons. Completed projects often provide the open spaces needed for parks, golf courses, and other recreational facilities.

Deficiencies of Solid Waste Management

Conclusions drawn from the 1967 statewide survey provide compelling evidence that solid waste management, as currently practiced in California, is unsatisfactory. The areas of deficiency, detailed in Volume I, are summarized below.

a. *Fragmented Authority and Lack of Cooperation.* Numerous governmental jurisdictions and private interests are concerned with the regulation, collection, utilization, and disposal of solid wastes in California. Cities, counties, certain special districts, and several state and federal agencies in California are empowered to establish policy and standards, conduct planning programs, and operate solid waste collection and disposal systems. The most notable deficiency observed is the general lack of consistency with respect to policy, planning, and standards. In addition, cooperative efforts that might result in mutual benefit between jurisdictions often have been overlooked or sometimes avoided.

b. *Inadequate Planning.* Adequate plans to cope with the increasing volumes of solid wastes and diminishing land for disposal purposes have not been developed. Only 16 of the 58 counties have developed any form of county plan for solid waste disposal, and many of the plans which have been developed have not been adopted or implemented. Several of the existing county plans ignore consideration of the needs or plans of the incorporated cities in the county. Very few of the county plans include provisions for accommodating major industrial wastes (e.g., cannery wastes) and no county solid waste plan developed to date has considered the needs or problems of adjacent counties or cities.

c. *Inadequate Standards.* Over 70% of all of the major disposal sites inspected fell under the classification of open burning dumps. These dumps were producing flies, rats, smoke, odors, and unsightliness. Less than 10% of the sites were classified as acceptable sanitary landfills. Only 17 of the 58 counties have attempted to incorporate into local ordinances minimum standards for location and operation of disposal facilities. Moreover, most of the standards that have been adopted are not enforced. Lack of uniformity of standards from one area to the next is particularly apparent. What is considered a sanitary landfill by one jurisdiction is nothing more than an open dump by another jurisdiction's standards.

d. *Lagging Technology.* Solid waste technology is many years behind that available for the management of liquid and air-borne wastes. Almost all disposal methods now in use are forms of burning or burying. Progress toward conservation, reclamation, and reutilization of resources represented in solid wastes has been agonizingly slow.

e. *Inadequate Financing.* Many local operations are financially unable to undertake the planning and implementation programs necessary for effective solid waste management. Collection and disposal of domestic and commercial refuse in California are now costing an estimated 300 million dollars per year. Over 20 million dollars annually are spent in just operating the 716 general-use disposal sites. When the additional amounts spent for collection and disposal of industrial and some agricultural wastes are included, the total cost may well exceed 500 million dollars per year.

In summary, it may be acknowledged that the management of solid wastes in California consists largely of piecemeal, uncoordinated activities, designed to meet the immediate needs of artificially segmented geographical or operational units with little or no regard for regional planning and cooperation or for the preservation of environmental quality.

OUTLOOK

Poor solid waste management practices in use today will be replaced in the near future due to the increasing concern for protection of environmental quality. Existing technology is available to manage solid wastes without creating nuisances and pollution; in addition, people are becoming more aware that additional costs will have to be borne to obtain improvements. New guidelines and more restrictive regulations coupled with dissemination of existing technical information will undoubtedly be useful in stimulating improvements.

Research, investigations, and technical development efforts are in progress under sponsorship of the federal government for improvement of the storage, collection, transportation, processing, and disposal aspects of solid waste management. However, no radically new techniques, such as some new exotic disposal method, are visualized as becoming available in the next 10 years. Most methods now in use will undoubtedly continue to be used in the immediate future with new and improved techniques arising by gradual evolution from these existing processes and methods.

Storage methods are in need of improvement from the standpoints of environmental sanitation and efficiency in waste removal. During the next 10 years, on-premise storage techniques for residential solid wastes will probably involve changes limited to improving sanitation aspects only. Metal containers will find rising competition from plastic containers and "disposable" paper or plastic refuse bags. Small compaction units will become available to compress the refuse from a home into smaller volumes as a convenience to the householder. Containerization, of wastes, especially commercial and industrial, will increase through the use of large movable bin-type containers due to the savings in collection costs that may be accrued.

The major influences on collection practices will be increasing labor costs and the additional travel time involved in reaching more distant disposal points. Collection of refuse will include greater use of large compactor collection vehicles having improved compaction and ability to receive bulky wastes. Automated pickup concepts utilizing various hoisting and lifting equipment will be developed for these vehicles to reduce the amount of labor required and allow greater ease in the loading process.

As disposal sites require longer hauling distances from the centers of production more transfer stations will be used. Extreme long-distance hauling (200 miles or more) to distant disposal sites may be used involving transport via railroads. Another possible long-distance transfer method may be pipelines employing slurry pumping or pneumatic transport.

Automated systems to convey refuse from multiple production points are pointed to as the space age technology. With such systems, refuse from homes may be collected through use of underground tubes evacuated by a collection truck at the curb or by a neighborhood pneumatic tube system that discharges the collected refuse to a central pickup point. For large buildings such as offices, apartments, and hospitals, piped collection systems are becoming available that may be built into the structural complex reducing the storage needs and providing a link with a centralized storage and collection system. Ultimate development could result in conveyance of the refuse pneumatically all the way to the point of processing or disposal. The concept of grinding garbage to sewers may also be expanded to use the transport capacity of the existing sewer system. However, for such a system, improved techniques will have to be available to process the sewage-refuse mixture at the treatment plant to avoid increasing the burden on the water resource.

The future will bring greater emphasis on reclamation and conversion of wastes to useful products. However, large scale processing systems will probably not be available in the next 10 years. In this interim, land disposal will be the dominant system. Future landfill practices will involve construction of larger sites, use of specialized equipment to increase the efficiency and effectiveness of landfill operations, and preprocessing by baling, grinding, or pulping prior to landfilling. Interest in methods other than land disposal is growing, especially with the expected increase in transportation and land disposal costs. Incineration will play a larger role in solid waste management in California through various refinements of incinerators to ensure more complete combustion, to utilize the heat, and to reduce or eliminate the air pollution problem involved with the combustion products. Specialized on-site incinerators serving high volume waste producers will be a valuable volume reduction tool and will be the area of greatest application of incineration for the next 10 years. Other processing methods such as wet oxidation, pyrolysis and composting will be more widely used for certain wastes.

Management methods of the future will develop from planning for solid wastes as regional systems, incorporating all municipal, industrial, and agricultural wastes. Within a wasteshed there will be a variety of processing and disposal methods utilized to adequately handle the diversity of wastes. Evaluation techniques will be improved so decision-making processes may assess proposed management methods by a cost benefit ratio between system costs and the effect on environmental quality. With a better understanding of the total costs and not just the initial monetary cost, systems recognizing the resource value of solid wastes will be more prevalent.

CHAPTER III

SOLID WASTE MANAGEMENT RESPONSIBILITIES

Resolution of the problems created by the ever increasing production of solid wastes in California can only result from a coordinated program incorporating the resources of state and local government and private industry. It is neither feasible nor desirable to consider any single level of government competent to assume all of the responsibilities to be assigned in a comprehensive solid waste management program. Each level of government must assume its logical and equitable responsibilities, so defined as to minimize duplication and conflicts, and to maximize cooperation and collaboration.

The basic objective of the statewide program should be the development of solid waste management systems that protect the health, welfare, and well-being of the public, and that offer positive approaches to improving the quality of the environment. Meeting this objective will require management practices designed to eliminate health hazards and environmental degradation, with priority attention focused on: flies, rodents, and other vectors; air, water, and land pollution; scenic blight and aesthetic eyesores; and public nuisances related to the accumulation, storage, collection, processing, and disposal of solid wastes. A comprehensive program should also give maximum attention to economic efficiency, reduction of waste production, reutilization of materials in solid wastes, conservation of natural resources, and preservation of the ecological balance of the environment.

The following sections elucidate the proposed division of responsibilities between state and local government. Clear lines of division will in some instances be difficult, and certain responsibilities must, of necessity be shared by both state and local governments. This will require close effective communication, active cooperation, and flexible interaction between state and local governments. The State Department of Public Health and local health departments, operating under the State Health and Safety Code, now possess this required framework for effective collaboration.

The delegation of responsibility has been assigned on the basis that the state should direct its attention primarily to those aspects of solid waste management which are of statewide concern. Matters of local interest only should be the concern of city, county, and regional agencies. It is implied that factors of state concern primarily include responsibilities which may have a broad bearing on public health or the overall environment. Each element of the program should be assigned to the most responsive governmental level which can effectively handle it.

Basic factors inherent in any comprehensive solid waste program must include the following:

a. Formulation of policy
b. Program establishment and administration
c. Establishment of regulations
d. Planning
e. Financing
f. Acquisition and operation of facilities
g. Training and education
h. Public information
i. Surveillance, monitoring, and evaluation
j. Enforcement
k. Research and development

The term "local governments" in this report refers to incorporated cities, counties, and special purpose districts which are empowered to participate in solid waste management. A solid waste management system designed as a regional concept is highly desirable and should be encouraged; however, this report does not specifically propose the establishment of a new level of regional government. In this program existing local agencies are encouraged to seek regional solutions through cooperative planning and action. This is particularly true in the planning function, which should be strongly encouraged. Possible incentives such as financial assistance for regional planning would be highly desirable.

It is important that the capabilities of private enterprise be considered in meeting the program objectives. Considerable contributions are available from the private sector in the aspects of operation, research, equipment and hardware development, and materials reclamation.

The following are the proposed primary responsibilities of the state and local governments in solid waste management.

STATE RESPONSIBILITIES

The program at the state level should centralize its policy formulation, provide overall coordination and guidance of state and local efforts, emphasize conservation of resources, develop environmental objectives and standards, and stimulate improved technology. Specifically, the State should:

1. Formulate basic statewide health and environmental policies regarding solid waste management.

2. Establish guidelines for solid waste management plans; review and approve local solid waste management plans for conformance with state policies; and coordinate these plans when practical into regional or statewide, long-range solid waste management plans.

3. Develop and adopt minimum standards for aspects of the solid waste handling system such as storage, collection, transportation, processing, disposal and utilization of solid wastes and establish and coordinate an effective means of enforcement.

4. Provide for continuing surveillance and monitoring of solid waste management practices in the state; maintain an inventory of solid waste processing or disposal facilities; and serve as a source of information for all interested agencies and persons.

5. Provide technical assistance and consultation (supplementing that available from local agencies) to local agencies requesting aid.

6. Conduct and encourage high priority technical studies related to unmet problems of solid waste management. These studies might be conducted by the State independently, jointly with other agencies, or by contract, and should fully utilize federal, state, and contract funds available for this purpose.

7. Define needs and facilitate and coordinate research and development; evaluate new or improved methods, materials, techniques, and equipment; and establish a technical information reference center for exchange of solid waste information.

8. Maintain liaison with federal solid waste programs to provide coordination of grants and loans for solid waste planning and program implementation.

9. Establish and maintain a program of training, education, and public information regarding solid waste management.

10. Administer such financial assistance as may be established by the State Legislature.

RESPONSIBILITIES OF LOCAL GOVERNMENT

Responsibilities of cities, counties, and districts should include establishment and administration of local policies, detailed planning, regulation, and operation of solid waste programs and systems. These agencies when possible should also conduct needed studies and public education programs.

Specifically, within their jurisdictions, local agencies should:

1. Develop detailed, short and long-range plans for the management of solid wastes generated within their respective areas. Each county should have the responsibility for developing an overall, coordinated county plan which takes into account the specific needs and plans of cities and districts.

2. Determine the methods of disposal to be utilized as well as the locations of disposal facilities.

3. Develop and adopt local ordinances governing storage, collection, transportation, and disposal of solid wastes. These ordinances should be compatible with the minimum standards established by the State, but could be more restrictive and comprehensive.

4. Assure that the location and operation of all solid waste systems comply with applicable state and local standards and ordinances, and provide necessary inspection services therefor.

5. Assure adequacy of collection, transportation, and disposal systems, including those provided by private firms or by agreement with another jurisdiction. This might involve the establishment and regulation of collection agencies, determining the type and level of service needed, providing permits and franchises, and determining rates and charges.

6. Determine the methods to be used for financing local solid waste management programs, including the utilization of federal and state grants or loans.

RESPONSIBILITIES OF PRIVATE INDUSTRY

Private industry has a broad base of affiliation with solid waste management. This affiliation must account for: (1) industrial and agricultural activities as sources of solid wastes; (2) producers of consumer products which may eventually become waste; (3) private service associated with collection, transportation and disposal of solid wastes; (4) the activities of salvage and reclamation of waste products through secondary materials industries; (5) manufacturers and suppliers of equipment used in solid waste handling and; (6) consulting firms which serve the planning function in solid waste management. To be effective, a statewide program of solid waste management must be cognizant of the capabilities and resources of these entities.

Private industry should develop an acute awareness of the vital role they play in solid waste management. In order for industry to meet its responsibilities effectively it must:

1. Recognize the possible effects of its activities on people and the environment, and develop policies directed toward enhancement of environmental quality.

2. Conduct its operations and activities in manners which do not create health or nuisance problems.

3. Participate in community affairs, public meetings, and other functions which concern solid waste management.

4. Work jointly with governmental agencies and contribute appropriate talents toward stimulating, planning, developing, and implementing sound solid waste management programs.

5. Keep pace with technical developments and related knowledge in the field of solid waste management and utilize the best available information toward providing the most efficient, effective, and economical service to the public.

At the same time, governmental agencies should recognize the capabilities of the private sector in achieving solutions to solid waste management problems, and should utilize these capabilities to the fullest practicable extent.

CHAPTER IV

PROPOSED STATE PROGRAM

In order to establish the framework of a coordinated solid waste program, it is essential that the State assume program responsibilities of the type outlined in the previous chapter. In general, these responsibilities have not been acknowledged by the State nor have adequate provisions been made to meet them.

To achieve an effective program of solid waste management, a comprehensive action plan must be developed and implemented. Such a program must recognize several important limiting conditions including:

1. The action plan must be compatible with the existing political structure of the state and cannot exceed the financial capabilities of affected agencies and persons.
2. The division of responsibilities for implementing each element of the plan must be clearly defined.
3. The action plan must be based upon workable technology. To establish standards or regulations, for example, which would require technology beyond that which exists or is readily attainable would be self-defeating.
4. The action plan should strive to achieve maximum benefit to the people at a reasonable cost input.
5. The plan must be viable and sufficiently flexible to respond to changes in objectives, technology, and program modifications.

In developing the action plan outlined in this chapter, the above constraints have been carefully considered and adhered to. Full cognizance has been taken of established state programs in other fields of environmental management, such as air and water pollution control. Many elements of the proposed program have been patterned after those of other environmental programs in the state which have proven to be effective and efficient.

Before programs dealing with liquid and air-borne wastes were developed in California it was necessary to adopt basic enabling legislation providing the necessary authority and responsibility. Similar legislation is urgently needed in the solid waste field. The basic provisions of a suggested legislative act are detailed in Chapter V of this report. Without such basic statutory authority, an effective statewide solid waste program cannot be implemented.

There is no intent or desire to detract from or limit any existing responsibilities or authorities granted to other state agencies relative to solid wastes. Currently, the Air Resources Board carries principal State responsibility for air pollution control. The Water Resources Control Board has a similar role relative to water pollution and water quality. Yet several other departments continue to have significant responsibilities in these areas, which relate to their broad missions. A comparable relationship is envisioned here with respect to solid wastes, with the Department of Public Health having primary, but not exclusive, responsibility.

In the same context, the proposed state program does not remove or limit any existing responsibilities or authorities of local governments. It would, in fact, strengthen local programs by providing guidance, assistance, continuity, and greatly needed additional enforcement tools. The proposed program would also provide for maximum coordination through the already established interaction that exists between State and local health departments.

In developing the proposed plan, various alternatives for meeting the program objectives were evaluated. The primary guidelines used to evaluate alternatives were: (1) probable effectiveness in achieving desired results; (2) manpower resources and experience; and (3) financial considerations. Each recommended action represents what was believed to be the most promising alternative based on these criteria.

The proposed plan is divided into five areas of responsibility: (1) Technology; (2) Planning; (3) Standards and Regulations; (4) Surveillance; and (5) Information and Training. Each of these areas of responsibility is defined to meet specific program objectives.

TECHNOLOGY

Technology that has been applied to solid waste management lags many years behind that applied in the management of liquid and air-borne wastes. Almost all disposal methods now in use are forms of the traditional practices of burning or burying. Technology for solid waste handling is primarily deficient in two general areas: those areas requiring further basic research, and those areas calling for demonstration and refinement of known techniques.

While many new methods and concepts may have potential merit, most local governments cannot risk the expenditure of public money necessary to attempt unproven processes. Demonstration and development of these techniques must therefore be financed by private interests, undertaken directly by state or federal government, or by some kind of financial assistance program.

There are major deficiencies in coordination of solid waste research and developmental work in California. This lack of coordination has resulted in an anomalous piecemeal approach toward technological development. A focal point at the State level is needed to coordinate technological efforts, avoid duplication, and to stimulate effort in all areas of need.

The lack of good basic data on solid waste technology is hindering research and developmental efforts. There is need for a centralized source of information including a technical reference center or data bank, which would serve as a mechanism for exchange or dissemination of data and information. The results of studies could thereby be made readily available to operational programs.

Technology Objectives

The objectives are to stimulate, coordinate, and participate in a broad program of solid waste technological development in order to develop knowledge, techniques, and methods of solid waste management which will minimize public health and other environmental problems, provide greater efficiency in solid waste handling, and provide maximum conservation of our natural resources.

Recommended Means of Accomplishment

In general, the State's role in this effort should concern itself with coordination of state and local efforts, participation in studies, supplying consultation on individual projects, and providing some degree of financial assistance. This role would be accomplished by the Department of Public Health through the following tasks:

a. Promoting, conducting, and participating in special research and development projects which relate to public health or other aspects of the environment. These projects would be conducted either independently, jointly with other agencies, or by contract with other agencies or private firms. These projects would be undertaken with available resources supplemented by maximum utilization of grant funds.

b. Coordinating technical research and demonstration projects. This would involve functioning as a focal point for information regarding these activities, establishing liaison with the Federal government and the State's universities and colleges, and conducting periodic review of on-going projects.

c. Functioning in a technical advisory capacity to new and on-going projects to provide maximum communication between projects and to avoid unnecessary duplication of effort. This would necessitate participation on technical review committees for individual projects as well as providing assistance in obtaining grants and developing new projects. The Department would also promote and stimulate technical developmental activity in those areas of need where insufficient attention is being directed.

d. Establishing a technical reference center of solid waste information and providing for maximum utilization of new knowledge and improved methods through the accumulation and dissemination of current information regarding solid waste developments.

e. Administering for the State, any financial assistance or grant programs for solid waste technological development.

PLANNING

Adequate solid waste planning at all levels of government is vital if solid waste management programs are to be effective. Few comprehensive long-range plans have been developed. Most planning efforts are stimulated primarily by impending crises. Planning for proper solid waste handling should be given a priority equal with planning for other service utilities.

Solid waste planning efforts at the local level have generally been hampered by lack of money, public apathy or opposition, and lack of coordination. Cooperative planning is essential since 83% of our incorporated cities rely on another jurisdiction, usually the county, for the location of disposal facilities for some or all of their wastes. The county, therefore, would appear to be the logical existing governmental level to provide detailed local solid waste planning. Only 16 of the 58 counties have developed a general plan for solid waste management. Many of these are incomplete, including only certain types of wastes, considering only part of the county, or considering only disposal aspects. Several of the completed plans have not been adopted or implemented.

No state mechanism or authority exists to encourage cooperation, to stimulate more regional programs, or to coordinate planning efforts. One means of providing this stimulation would be through financial assistance based on regional planning.

Detailed planning for the individual disposal sites is also deficient. Planning in this regard often consists of the acquisition of the most readily available land, followed by the immediate initiation of dumping operations. Frequently local agencies are forced to acquire land which is unsuited to sanitary landfill operations because of public opposition to more appropriate locations. Disposal operations are sometimes commenced before it is determined that the location, topography, soil conditions or other factors will make it impractical to operate a suitable landfill operation. The lack of a definite, engineering plan for a landfill site usually results in health hazards, nuisances, environmental degradation, and unnecessarily high operational costs.

Usually little thought is given to the ultimate reuse of the completed landfill. Planning for site acquisition and reuse frequently is not integrated with other land use planning.

Planning Objectives

The objectives are to assure coordinated development of projected plans for effective and efficient solid waste management for all areas of the state, and to assure that individual solid waste disposal facilities are planned and designed to prevent the creation of nuisances and hazards and environmental degradation during operation and subsequent reuse.

Recommended Means of Accomplishment

The role of the State in solid waste planning should be to provide the guidance, stimulation, coordination, and assistance necessary to develop effective solid waste management programs. Detailed planning for solid waste management should be accomplished at the local level with coordination provided by county health departments.

The objectives relating to *general solid waste management plans* would be achieved by the Department of Public Health undertaking the following tasks:

a. Establishing criteria and guidelines for use by counties or regional agencies in developing their solid waste plans.

b. Requiring that all counties develop a comprehensive plan for solid waste management to be reviewed by the Department for conformance with state standards.

c. Coordinating solid waste plans of adjacent counties, considering the needs of long-range regional plans.

d. Providing assistance in resolving planning conflicts between local jurisdictions.

e. Stimulating regional planning through solid waste planning loans or grants, as may be made available from State or Federal sources, in a manner which offers financial incentives for cooperative planning.

f. Rendering technical planning assistance to local agencies.

The objectives relating to *detailed plans for individual disposal facilities* would be achieved through the following tasks:

g. Developing design criteria and guidelines for use in preparing disposal facility plans.

h. Requiring that sufficient information for each new disposal facility be submitted as part of the application to the Department for registration for determination of its capabilities to meet standards.

i. Providing planning assistance on public health and other environmental quality aspects of layout and design of disposal facilities.

STANDARDS AND REGULATIONS

Volume I of this study demonstrated the existence of public health hazards, nuisances, and related environmental problems attributable to current solid waste management practices. Most of the disposal sites fall into the category of open dumps. While the reasons for such a large percentage of unsatisfactory operations are complex, one of the most apparent factors is the lack of adequate standards and regulations governing solid waste management.

A number of state agencies have developed regulations pertaining to their specific interests (i.e., fire control laws and water quality protection), but there are no comprehensive standards relating to the protection of public health and the environment from the effects of solid wastes.

Only 17 of the 58 counties have incorporated into local ordinances some form of minimum standards for location or operation of disposal sites, and some of these ordinances are not enforced. The inconsistency of standards from one jurisdiction to the next is particularly apparent. What is considered a "sanitary landfill" by one jurisdiction is essentially an open dump to another. Jurisdictional problems are also encountered in attempting to enforce standards. A county, for example, cannot enforce its standards within city boundaries or vice versa.

Local regulations regarding disposal sites usually refer only to the general-use sites which receive residential refuse. A considerable amount of waste material (demolition, industrial, agricultural, etc.) is disposed of in unrecognized sites, and therefore unregulated. One of the more urgent needs is for standards applicable to management of hospital wastes, pesticides, and other hazardous materials.

Standards for storage, collection, and disposal should take into account the varied conditions found throughout the state and should facilitate local government enacting more restrictive standards. Enactment of standards must allow for an interim period during which substandard operations could be phased out or upgraded. This interim period should also make allowance for schedules developed for local planning purposes.

Standards and Regulation Objectives

The primary regulatory objectives are to develop, establish, and ensure enforcement of reasonable basic standards and regulations to assure orderly and sanitary storage, collection, transportation, processing and disposal of municipal, industrial, agricultural, and special hazardous wastes.

Recommended Means of Accomplishment

These objectives can be effectively achieved by the Department through accomplishment of the following tasks:

a. Identifying those aspects of solid waste management which are in need of basic state standards and undertaking necessary data-gathering and developmental work, preparatory to enacting standards.

b. Developing minimum standards for management of solid wastes cooperatively with other state and and local agencies and with the assistance of a Solid Waste Advisory Committee.

c. Reviewing proposed standards with concerned persons and agencies, holding public hearings, making necessary revisions and adopting final standards.

d. Making provision for inspection and enforcement, either directly or by local health departments; establishing criteria and procedural guidelines for enforcement of standards; reviewing and coordinating local enforcement programs; and providing assistance and consultation where needed.

e. Enforcement of the requirement that all disposal sites in the state be registered with the Department.

f. Developing reasonable administrative rules and regulations to facilitate development and implementation of the standards and the facility registration program.

SURVEILLANCE

An adequate baseline of information is essential for state and local agencies to develop and formulate sound policies, programs, and financing plans for solid waste management. The statewide study documented existing practices, programs, and facilities. This valuable information is being used by the Department and other agencies in developing solutions to solid waste problems. There is, however, no mechanism for sustaining this data on a current basis nor is there a projected plan for systematic compilation, assessment, and evaluation of information on solid waste management in California.

Surveillance Objectives

Sustained surveillance is required to determine the location and extent of problems, the effectiveness of programs and facilities, progress being made toward meeting goals, and to develop and keep current basic information on solid waste management.

Recommended Means of Accomplishment

These basic objectives can best be accomplished by the Department undertaking the following tasks:

a. Periodic inventories and updating of the present basic programs, facilities, and operational data to provide information needed for program development and revising or updating standards and operational criteria.

b. Requiring that certain basic information be submitted periodically for each registered disposal facility.

c. Compiling this information in the technical information reference center (as indicated under Technology), which would be a central source of information for all state and local agencies and interested persons. The reference center would be kept current through information input from surveys, investigations and evaluations, program reviews, facility inspections, permit applications, review of research projects, and other sources.

d. Conducting special studies and surveys to evaluate actual or potential solid waste problems, as well as the effectiveness of new techniques, practices, and programs.

e. Conducting routine monitoring of solid waste disposal facilities to evaluate the degree to which state standards are being met. Since primary monitoring and inspection would be done by local health departments, these evaluations would usually be made on an infrequent basis and would supplement the basic inspection program of local health departments.

f. Periodically reviewing local solid waste programs to evaluate their effectiveness, and determine where assistance may be needed.

INFORMATION AND TRAINING

One of the major obstacles to establishment of effective solid waste management programs is a lack of public awareness of problems and of the need for comprehensive solutions. There have been marked increases in public interest and concern over pollution of the environment in recent years. There remains, however, a general lack of knowledge about environmental effects of solid wastes and the need for improved programs. This is sometimes evident among those officials who must make program decisions as well as the public who must support and finance these programs.

Among those who have recognized the problems, there often is a lack of technical knowledge and experience needed to conduct or implement solid waste programs. With the advent of higher standards, improved programs and facilities are a necessity. Those responsible must have sufficient technical training to carry out their programs effectively.

A dynamic program is needed to provide necessary training, create the proper public awareness, interpret the results of research, and disseminate information. There is no present mechanism to provide an organized approach to public information and training. This is vital to a comprehensive statewide program of solid waste management.

Information and Training Objectives

The basic objectives of this aspect of the program would be to develop public awareness of solid waste problems and responsibilities, and generate improved programs through a comprehensive approach toward public education, training, and information.

Recommended Means of Accomplishment

These objectives can best be achieved by accomplishment of the following tasks:

a. Establishing a service for disseminating information on the various aspects of solid waste management. Information would be supplied to agencies on request as well as through reports, publications, presentations, articles and other informational media.

b. Organizing, sponsoring, and encouraging technical seminars, training courses, workshops, and demonstrations of improved practices and technology for local officials, program managers, and operators of facilities.

c. Supporting and encouraging local public education programs by supplying information and technical assistance.

d. Developing visual aids for public information including films, slides, displays, and other material.

e. Providing technical information and assistance to local solid waste programs to improve facilities and practices.

f. Support and assist local officials in developing a public information program devised to minimize the amount of "litter" that exists in escalating amounts on public and private property.

g. Assisting colleges and universities in developing curricula and conducting classes and seminars on solid waste management and environmental quality.

h. Establishing a government-industry liaison group to review, discuss, and seek solutions to solid waste problems of industry.

SCHEDULE OF IMPLEMENTATION

The transition from existing unsatisfactory solid waste management practices to acceptable programs will take time, with full implementation of all proposed objectives requiring a period of many years.

During this period, the energies of many agencies and individuals must be directed toward achieving the goals of the program. To bring substandard practices up to the minimum level of acceptance, for example, requires the following sequential steps:

1. Enactment of enabling legislation providing the Department with authority to establish the necessary solid waste program.
2. Organization and staffing of the Department to meet this responsibility.
3. Perform work where necessary, preparatory to establishing proposed standards and regulations.
4. Necessary reviews, public hearings, and adoption of standards and regulations along with schedule for enforcement.
5. Local program organization and staffing.
6. Completion of plans by affected agencies and persons for improvement of solid waste facilities.
7. Development of necessary financing arrangements, capital expenditures, and budgetary procedures.
8. Land acquisitions, purchase of equipment, modifications to existing facilities, construction, and other possible implementation steps.
9. Reviews and evaluations to assure compliance with standards and enforcement proceedings where necessary.

Program objectives such as improved technology, projected planning, and public information development, require different timetables for accomplishment. While the broad plan proposed in this report will require an extended period of time, some important specific goals, such as the elimination of open burning dumps, can be achieved within a relatively short period.

It is difficult to distinguish "short range" and "long range" goals in all cases. For purposes of this report, short-range goals are those which should be attained within a 5 to 10 year period; long-range goals probably will require more than 10 years.

The program proposed in this report, if implemented, would achieve the following goals:

Short Range

1. Establishment of environmental criteria and solid waste management standards.
2. Bringing existing disposal operations in the state to acceptable minimum levels, eliminating open burning of solid wastes at disposal sites, and eliminating open dumps and their attendant health hazards.
3. Prevention of unacceptable new disposal operations.
4. Completion of local comprehensive solid waste management plans for all areas of the state.
5. Improvement of solid waste management technology to achieve greater effectiveness and efficiency.
6. Establishment of public awareness and support for improved solid waste programs.

Long Range

1. Development of solid waste technology and programs which incorporate utilization of wastes instead of disposal.
2. Development of solid waste programs which enhance rather than degrade the environment.
3. Development of long-range plans for solid waste management on a broad regional basis for the entire state.
4. Incorporation of solid waste management programs into a broad consolidated environmental program of air, water, and land resource management.

The sequential steps necessary to initiate the proposed program as well as the time schedule for action are outlined in Table 2. This schedule outlines the administrative functions to establish the program elements as well as the continuing program activities.

PROGRAM RESOURCES AND COST REQUIREMENTS

The principal resource required to initiate this program is manpower. Few of the program activities require specialized equipment or laboratory facilities. The manpower needed would include engineers, planners, and others with disciplines related to solid waste management. There is not a large source of trained manpower to draw from since provisions for formal training have been meager and opportunities for professional experience in solid waste management have been limited. Some time will therefore be required to orient and train new personnel.

To determine the amount of personnel needed to accomplish the objectives stated, each task was analyzed in depth and the necessary minimum profes-

Table 2. Implementation schedule

	Year					
	1970	1	2	3	4	5
Administration						
Submission of final report to the Legislature	x					
Legislative action and enactment of enabling act	x					
Department organization and staffing		x				
Appointment of the Solid Waste Advisory Committee		x				
Standards						
Disposal sites—						
Background data and preliminary development work		x				
Reviews, public hearings, and final adoption		x	x			
Other disposal facilities—						
Background data and preliminary development work			x	x		
Reviews, public hearings, and final adoption				x	x	
Develop and adopt timetable for compliance with disposal site standards			x			
Revise and update standards as appropriate					x –	→
Planning						
Prepare criteria and guidelines for countywide master plans		x				
Submission of countywide master plans for department review		x	x	x		
Administration of state grants for planning		x	x	x		
Provide technical planning assistance to local agencies		x –	—	—	—	→
Coordination of local plans into regional concepts			x	x	x	x
Regulations and Surveillance						
Adopt administrative rules for registration of disposal sites		x				
Adopt criteria for county health department solid waste programs		x				
Adopt criteria for information to be submitted with application		x				
Develop application forms for disposal facility registration			x			
Prepare schedule for registration of existing disposal facilities			x			
Develop procedural methods for monitoring and enforcement			x			
Registration of existing disposal sites			x	x	x	
Develop standardized rating system for disposal site inspection		x	x			
Develop standard inspection forms for use by local agencies			x			
Enforcement of standards				x –	—	→
Conduct supplemental monitoring program				x –	—	→
Develop suggested model ordinances for local agencies		x	x			
Develop criteria and guidelines for design of new disposal facilities		x	x			
Registration of new disposal facilities			x –	—	—	→

Table 2. Implementation schedule (continued)

	Year					
	1970	1	2	3	4	5
Information and Training						
Prepare basic inventory schedule and necessary forms		x				
Develop and maintain technical reference center and information retrieval system		x –	—	—	—	→
Establish systematic means of disseminating information and data			x			
Conduct comprehensive public information and training program		x –	—	—	—	→
Technology						
Establish liaison procedure with federal government and state university		x				
Conduct special studies on specific solid waste problems			x –	—	—	→
Coordination of research and development projects in state		x –	—	—	—	→
Evaluation of new techniques, methods, and equipment for solid waste handling		x –	—	—	—	→
Provide technical assistance to state and local agencies		x –	—	—	—	→

sional personnel requirements determined. The manpower requirements for the first five years of the program are summarized in Table 3. The manpower figures shown in this table indicate professional persons and do not include clerical or other supportive personnel. These persons as well as all administrative, overhead, travel, equipment, and other costs are included in the total cost figures. The total cost of the program would range from $368,000 the first year to the full operational level of $575,000 by the third year. At the present time, there are only two professional, state supported staff members working full time on solid waste activities.

Table 3. Manpower allocation and program costs

Program Item	Manpower allocation in man-years				
	First year	Second year	Third year	Fourth year	Fifth year
Standards	2.0	3.0	3.0	3.0	2.0
Regulation and surveillance	3.0	4.0	7.0	8.0	9.0
Planning	8.0	9.0	7.0	4.0	3.5
Public information	3.0	3.0	3.0	4.0	4.0
Technology	3.0	6.0	6.0	7.0	7.5
Administration	3.0	4.0	4.0	4.0	4.0
Total	22.0	29.0	30.0	30.0	30.0
Total program cost	$368,000	$545,000	$575,000	$575,000	$575,000

CHAPTER V

PROPOSED LEGISLATION

The development of adequate laws and regulations is a major factor in the success of a comprehensive solid waste management program. Existing state laws regarding solid waste management are generally incomplete and outmoded. Code sections are now aimed at protecting water, air, and wildlife; preventing forest fires; and maintaining highways free of litter. Even the health of hogs is protected from the disease hazards of garbage (cooking requirements for vesicular exanthema control). Laws designed specifically to protect people, their health, and well-being from hazards and nuisances of solid wastes are, however, generally lacking. Perhaps the most notable deficiency is that no state agency has an overall responsibility for establishing solid waste management policy.

Regardless of the validity of a program plan, it is of little value unless it can be implemented. The program plan presented in this report cannot be implemented within the existing framework of laws in California. It is essential, therefore, that an adequate statutory basis be established. Specific enabling legislation providing for authority and responsibility for solid waste management is needed. A comprehensive enabling act such as those which established the air and water quality programs in California should be the basic mechanism for an effective solid waste program. The program plan proposed in Chapter IV was developed on the premise that such basic legislation would be developed.

The following section presents a suggested "Solid Waste Management Act" which would overcome existing legislative deficiencies and allow the proposed program to proceed. Initial enabling legislation such as that proposed would establish the mechanism for solving the immediate problems as well as providing the structure for achieving long-range goals and objectives. The second section presents suggested changes in the State Health and Safety Code to provide uniformity and continuity which would supplement the enabling legislation.

PROPOSED SOLID WASTE MANAGEMENT ACT

An act to add Chapter 5 to Part 2 of Division 5 of the Health and Safety Code relating to solid waste management; defining responsibilities and delegating authority therefor; establishing procedures; and declaring effective dates.

The people of the State of California do enact as follows:

Article 1. State Policy

Sec. 4500. The Legislature finds that the volume of solid wastes being generated within the state and the present provisions generally made for managing such wastes have resulted in conditions threatening to the public health, safety and well-being, specifically causing severe problems of flies, rodents, water and air pollution, litter and widespread environmental degradation. This situation arises from a combination of concurrent factors, including rapid population increase, decentralized residential growth, industrial expansion, agricultural changes, transportation improvements and technological developments in manufacturing, packaging and marketing consumer products, collectively causing grave economic limitations upon land availability for traditional solid waste management practices.

The Legislature further finds and declares that traditional methods of solid waste management in this state, largely directed toward land disposal, are no longer singularly adequate for future solid waste management. Conservational methods directed toward salvage, recycling and utilization are regarded as essential to the long-range preservation of the public health, safety, well-being, economy and environmental quality of the state.

The Legislature further declares that it is necessary to the health, safety and well-being of the people of this state that there be established a state directed program of solid waste management, providing for the coordination of solid waste management activities of the various state agencies, the political subdivisions of the state and private enterprises engaged in solid waste activities, in order to protect the environment and to assure systematic implementation of sound solid waste management practices.

Sec. 4501. It is the policy of the State of California, in furtherance of its responsibility to protect the public health and safety, to institute and maintain a comprehensive statewide program for solid waste management which will assure that solid waste systems do not adversely affect the health, safety, and welfare of the public and do not degrade the quality of the environment by reason of their location, design, method of operation, or other means; and to the extent feasible and practical, that solid waste management systems be designed and operated to make maximum utilization of the resources contained in solid wastes.

Sec. 4502. It is the intent of the Legislature that the State Department of Public Health shall be the agency charged with primary responsibility for the direction, coordination, and control required of solid waste management activities. The Department in exercising any authority assigned in this Act shall conform to and implement the policies of this Chapter and shall at all times coordinate its activities with those of other state agencies and local political jurisdictions so as to achieve a unified and effective solid waste management program in this state.

Sec. 4503. It is the purpose of this Act to effectuate the policies set forth in this Article by assuring programs which:

(a) Assign primary responsibility for adequate solid waste handling to local government, reserving to the state, however, those functions necessary to assure effective programs throughout the state.

(b) Provide for coordinated development of comprehensive plans for solid waste management by local government.

(c) Provide for the adoption and enforcement of basic minimum state standards for solid waste handling and disposal.

(d) Provide technical assistance to local governments in the planning, development, and conduct of solid waste management programs and operations.

(e) Coordinate and facilitate research and development in the technical phases of solid waste management.

(f) Encourage utilization, wherever appropriate and feasible, of the capabilities of private industry in accomplishing the objectives of this Act.

Sec. 4504. No provision of this Act or any ruling of the Department is a limitation:

(a) On the power of a city or county, or city and county to adopt and enforce additional regulations, not in conflict therewith, imposing further conditions, restrictions, or limitations with respect to the handling or disposal of solid wastes.

(b) On the power of any city or county, or city and county to declare, prohibit, and abate nuisances.

(c) On the power of the Attorney General, at the request of the Department, or upon his own motion, to bring an action in the name of the people of the State of California to enjoin any pollution or nuisance.

(d) On the power of any state agency in the enforcement or administration of any provision of law it is specifically permitted or required to enforce or administer.

(e) On the right of any person to maintain at any time any appropriate action for relief against any private nuisance as defined in the Civil Code.

Article 2. Definitions

Sec. 4510. As used in this Act, unless the context indicates otherwise:

(a) "Person" also includes any city, county, district, the state or any department or agency thereof.

(b) "Department" means the State Department of Public Health.

(c) "Solid waste" or "refuse" means all putrescible and nonputrescible solid and semisolid wastes including garbage, rubbish, ashes, industrial wastes, demolition and construction wastes, abandoned vehicles or parts thereof, discarded home and industrial appliances, manure, vegetable or animal solid and semisolid wastes, and other discarded solid or semisolid materials.

(d) "Solid waste handling" includes the storage, collection, transportion, treatment, utilization, processing, and disposal of solid wastes.

(e) "Disposal facility" means any facility or location where any treatment, utilization, processing, or deposition of solid waste occurs.

(f) "Disposal site" means the location where any final deposition of solid waste occurs.

(g) "Nuisance" means anything which: (1) is is injurious to health, or is indecent or offensive to the senses, or an obstruction to the free use of property, so as to interfere with the comfortable enjoyment of life or property; and (2) affects at the same time an entire community or neighborhood, or any considerable number of persons, although the extent of the annoyance or damage inflicted upon individuals may be unequal; and (3) occurs during or as the result of the handling or disposal of solid wastes.

Article 3. General Powers and Duties

Sec. 4515. The Department shall prepare and adopt, and may revise when appropriate, minimum standards for solid waste handling and for the location, design, operation, maintenance and ultimate reuse of solid waste disposal sites and facilities. The Department may adopt varying standards for different areas of the state depending on population density, climate, geology and other factors relevant to solid waste handling and disposal.

Sec. 4516. The Department, in performing its duties under this Act shall:

(a) Establish procedures for evaluation and coordination of research and development regarding new or improved methods of solid waste handling and disposal and may conduct studies as appropriate.

(b) Prepare and implement a statewide solid waste management information storage and retrieval system coordinated with other state information systems.

(c) Implement a public information program on matters concerning solid wastes and maintain a technical reference center on solid waste practices and programs and related information.

(d) Formulate technical criteria and suggested guidelines for use by local agencies in development, planning, implementation and operation of local solid waste management programs.

(e) Render technical assistance to state and local agencies and others in the planning and operation of solid waste programs.

(f) Provide for appropriate surveillance of solid waste handling and disposal practices in the state to determine compliance with state standards and regulations.

Sec. 4517. The Department may adopt and enforce all reasonable rules and regulations necessary and appropriate to accomplish the purposes of this Act.

Article 4. Solid Waste Disposal Requirements

Sec. 4520. Effective January 1, 1973 it shall be unlawful for any person to maintain, conduct, or operate an existing solid waste disposal site or facility or to establish a new disposal site or facility unless that site or facility is registered with the Department.

Sec. 4521. Applications for registration of a disposal site or facility shall be on forms prescribed and furnished by the Department and shall contain a description of the proposed and existing facilities and operations at the site as well as such additional information the Department may deem necessary in order to determine whether the site and facilities located thereon will comply with minimum state requirements.

Sec. 4522. Following proper application, the Department or its delegated agency shall issue a registration certificate for the operation of each solid waste disposal site or facility which meets the criteria and standards as adopted by the Department. Such certificate shall remain in effect until the completion or discontinuance of use of the disposal site or facility unless revoked by the Department. Such certificate shall not be transferable should changes in disposal site or facility ownership occur.

Sec. 4523. Each applicant for disposal site or facility registration shall first secure approval for operation of said disposal site or facility from the local governmental agency having apppropriate jurisdiction over land use. The Department shall not issue a registration certificate for any disposal site or facility until satisfactory proof or indication of such local approval is submitted.

Sec. 4524. Any registration certificate issued by the Department or its delegated agency as provided in this Article shall be revocable or subject to suspension at any time the Department determines that the disposal site or facility is being operated in violation of this Act or the regulations or standards adopted pursuant to this Act, or is creating a nuisance. The certificate may also be revoked for similar reasons by the Department upon recommendation of the local health officer.

Sec. 4525. In the event any registration certificate is to be denied, suspended or revoked, the affected persons shall be notified in writing and a hearing shall first be held thereon before the Department within thirty days after request therefor is made by the person whose registration is to be denied, suspended or revoked. Within fifteen days following the date of such hearing the Department shall notify all parties in writing of the determination of said hearing and the actions to be taken.

Sec. 4526. The provisions of Section 4520 may be waived by the Department as to specific types of disposal sites or facilities when it determines that such sites will not adversely affect the public health or the environment and will not create a public nuisance. Such waiver shall be conditional and may be terminated at any time by the Department.

Sec. 4527. Each approved local health department shall establish a solid waste program which meets the criteria established by the Department for compliance with the objectives and requirements of this Act. When the Department has determined that a local health department has developed such a program, it shall delegate such responsibilities under this Article as may be mutually agreeable to the Department and that local health department. The Department shall periodically review the solid waste programs of local health departments to determine compliance with this Act.

Article 5. Submission of Plans

Sec. 4530. Each county within the state, in cooperation with the various local jurisdictions located within such county, shall prepare a coordinated, comprehensive solid waste management plan. The appropriate County Health Department shall represent the Department in coordinating the preparation and development of the solid waste management plan. Such plan may cover more than one county.

Sec. 4531. Each comprehensive county solid waste management plan developed under Section 4530 shall be submitted to the Department for technical review and approval within three years after the effective date of this Act. The Department may recommend revisions essential to the achievement of the purposes of this Act.

Sec. 4532. The Department shall prepare guidelines for local comprehensive plans and shall provide technical assistance in the preparation, revision, and implementation of solid waste management plans required by this Act.

Sec. 4533. Each county or city, or county and city may adopt regulations or ordinances governing solid waste handling implementing the comprehensive solid waste management plan covering storage, collection, transportation, treatment, processing, utilization, and final disposal. Such regulations or ordinances should assure that solid waste handling and disposal facilities are located, maintained, and operated in a manner so as to protect the public health, prevent air and water pollution, and avoid the creation of nuisances. Such regulations or ordinances may be more stringent than the minimum standards adopted by the state.

Article 6. Other Powers and Duties

SEC. 4535. The Department shall establish a solid waste advisory committee to provide consultation to the Department concerning matters covered by this Act. The committee shall advise on the development of standards, rules and regulations for solid waste management, and shall supply recommendations concerning methods by which existing solid waste management practices and the laws authorizing them may be supplemented and improved. The committee shall consist of 10 members appointed by the Director and shall consist of persons knowledgeable in solid waste management. The members shall represent the interests of the public, local government, agriculture, manufacturing industry, local health departments, and the refuse removal industry.

Article 7. Enforcement

SEC. 4540. The minimum standards and regulations adopted by the Department pursuant to this Act shall be enforced by the Department or any local health officer. When established state standards and regulations are being satisfactorily enforced by any approved local health department the enforcement of the standards and regulations shall not be duplicated by the Department. The Department shall investigate to make this determination and may take direct enforcement action where appropriate.

SEC. 4541. Whenever, in the judgment of the Department, any person has engaged in or is about to engage in any acts or practices which constitute or will constitute a violation of any provision of this chapter, or any rule, regulation or order issued thereunder, and at the request of the Department, the Attorney General may make application to the superior court for an order enjoining such acts or practices, or for an order directing compliance, and upon a showing by the Department that such person has engaged in or is about to engage in any such acts or practices, a permanent or temporary injunction, restraining order, or other order may be granted.

SEC. 4542.

(a) Every civil action brought under the provisions of this Act at the request of the Department shall be brought by the Attorney General in the name of the people of the State of California and any such actions relating to the same disposal of solid wastes may be joined or consolidated.

(b) Any civil action brought pursuant to this Act shall be brought in a county in which the disposal of solid waste is made, or proposed to be made.

(c) In any civil action brought pursuant to this Act in which a temporary restraining order, preliminary injunction, or permanent injunction is sought, it shall not be necessary to allege or prove at any stage of the proceeding that irreparable damage will occur should the temporary restraining order, preliminary injunction, or permanent injunction not be issued; or that the remedy at law is inadequate, and the temporary restraining order, preliminary injunction, or permanent injunction shall issue without such allegations and without such proof.

SEC. 4543. No provision of this Act shall apply to the use of solid wastes in normal farming operations or in the processing or manufacturing of other products in a manner that will not create a public nuisance or adversely affect the public health. And, provided further, that these provisions shall not apply to an individual disposing of solid wastes originating from his own residence onto land or facilities owned by him when disposal of such wastes do not thereby create a public nuisance or adversely affect the public health.

SUGGESTED REVISIONS OF THE HEALTH AND SAFETY CODE

The Health and Safety Code includes provisions for the formation and maintenance of specific local districts to operate refuse collection systems or disposal facilities; for authorization of counties to issue franchise and cities to contract for refuse handling; for regulation of solid waste disposal to prevent pollution of waters and public places; and for regulation of refuse storage practices. Terminology used in the Code is not consistent, especially the definition of "garbage". Revisions are necessary to achieve uniformity with current language usage. The following are changes suggested for the various Code sections that pertain to solid waste management. These changes are primarily updating of terminology; the changes were made with an attempt to maintain the original intent of the law.

Section 936 (f)
—"garbage" should be changed to "refuse"

Part 2, Chapter 1
—Title "Garbage Disposal Districts" should be changed to "Refuse Disposal Districts"

Section 4105
—"Garbage Disposal District" should be changed to "Refuse Disposal District"

Section 4106
—"garbage" should be changed to "refuse"

Section 4107
—"garbage disposal district" should be changed to "refuse disposal district"

Section 4113
—"garbage and refuse disposal site" should be changed to "refuse disposal site"

Section 4120 (a)
—"garbage and other refuse matter" should be changed to "refuse"

Section 4120 (c)
—"garbage or other refuse matter" should be changed to "refuse"

Section 4121
—"garbage and other refuse" should be changed to "refuse"

Section 4121.1
—"garbage and other refuse" should be changed to "refuse"

Section 4127
—"garbage and other refuse" should be changed to "refuse"

Part 2, Chapter 1.5 (Sec. 4170–4197)
—Title "Garbage and Refuse Disposal Districts"—no change needed, title technically correct and this type of district may no longer be formed

Section 4200, 4201
—"garbage, waste, offal, and debris" should be changed to "refuse and solid waste"

Part 2, Chapter 2.5
—"City Garbage Disposal Contracts" should be changed to "City Refuse Disposal Contracts"

Section 4250
—same change as 4200

Part 2, Chapter 2.6
—Title "Garbage and Refuse Dumps" should be changed to "Solid Waste Disposal Sites and Facilities"

Section 4260
—(third line) "operated a dump or site for the disposal of garbage or refuse or transfer station or collection point for garbage or refuse" changed to "operated a disposal site or facility for the disposal of refuse, or transfer station or collection point for refuse"

Part 2, Chapter 3
—Title "Fumes Escaping From Burning Garbage" should be changed to "Fumes Escaping From Burning Solid Wastes"

Chapter 3, Article 1
—"Cremation of Refuse, Generally" should be changed to "Incineration of Refuse"

Section 4400
—change the term "garbage" to "solid wastes"
—make new listings by striking the following lined-out words:

(a) Garbage
(b) Swill
(c) Refuse
~~(d) Cans~~
~~(e) Bottles~~
~~(f) Paper~~
(g) Vegetable matter
(h) Carcass of any dead animal
(i) Offal from any slaughter pen or butcher shop
~~(j) Trash~~
~~(k) Rubbish~~
(l) Radioactive waste materials

Section 4401, 4402, 4403
—change "garbage" to "solid wastes"

Section 4475
—change the term "garbage" to "solid wastes"
—make new listings by striking the following lined-out words:

(a) Garbage
(b) Swill
(c) Refuse
~~(d) Cans~~
~~(e) Bottles~~
~~(f) Paper~~
(g) Vegetable matter
(h) Carcass of any dead animal
(i) Offal from any slaughter pen or butcher shop
~~(j) Trash~~
~~(k) Rubbish~~
(l) Abandoned and unidentifiable vehicles or vehicle bodies
(m) Abandoned iceboxes and refrigerators

Section 4476
—change "garbage" to "solid wastes"

Section 4740
—revise definition

Section 6406
—change "garbage" to "refuse"; make consistent with any action taken in Sec. 4740

Section 6512
—(2nd line) change "garbage dump sites and garbage collection and disposal systems" to "refuse disposal sites and facilities and refuse collection and disposal systems"
—(2nd paragraph) change "garbage dump" to "refuse disposal site or facility"

Section 6518.5, 6520, 6521
—change "garbage" to "refuse"

Section 18680, 18681
—no changes made at this time

Section 28201, 28567
—change "rubbish" to "refuse"

Section 28568
—add "and refuse"

Section 28612
—change "rubbish" to "refuse"

Section 28613
—add "and refuse"

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